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# IMPROVING THE PREDICTION OF ACADEMIC SUCCESS THROUGH DIFFERENTIAL WEIGHTING

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## THE PROBLEM AND THE METHOD

### Purpose

The purpose of the present study is to examine the possibility of improving the prediction of academic success in college by means of differential weighting of certain commonly used predictive instruments. The attempt will be made to discover the weightings which should be applied to these measures in order to obtain the best possible prediction of success in various types of undergraduate curricula.

### Subjects

The subjects used in this study were freshmen entering Marquette University in the Fall semesters of 1934, 1935, 1936, and 1937. The students enrolled in each of the four undergraduate colleges—Business Administration, Engineering, Journalism, and Liberal Arts—were treated as a separate group. Only those freshmen for whom all of the data were available were included. For the four colleges these included fifteen hundred thirty-three cases.

### Criterion

The criterion of academic success which was used throughout this study was grade earned during the first semester of the freshman year. It had been previously determined that the grade earned in the first semester had a reasonably high correlation with subsequent grades. This measure may, therefore, be accepted as a fairly accurate criterion of success. The advantage obtained by using the grade in the first semester only, is that such limitation provides a wider range of achievement. After the first semester those students at the lower end of the

distribution are eliminated, either voluntarily or involuntarily. This narrowing of the range may have the effect of lowering the correlations.

The grading system at Marquette University is based on the use of letters. In order to facilitate the computations required in this study these letters were translated into numerical equivalents, according to the following scale: *A*—4; *B*—3; *C*—2; *D*—1; *E*—.5; *F*—0. The grade for each freshman in each subject was obtained. The average grade was then computed, weighting each subject grade according to the number of hours of credit in the course.

## Predictive Measures Used

*Secondary-school Success.*—One of the measures which has frequently been used in previous studies is success during the secondary-school course. Since a wide variety of marking systems are found among high schools, and since apparently similar grades given by two different schools may in reality have entirely different significance, no attempt was made to use the actual grades earned. Instead, each secondary school was asked to furnish a statement of the relative standing of each of its graduates entering the University, in terms of the entire graduating class. These statements were of the form: Fourth in a class of sixty-five; twenty-seventh in a class of ninety-eight; one hundred thirty-fifth in a class of one hundred sixty; etc. These statements of relative position in the graduating class were then reduced to the form of percentile ranks. Wherever, in the study, success in high school, or rank in high-school class, is referred to, this measure of percentile standing in the graduating class is what is meant.

*Knowledge of Secondary-school Subject-matter.*— In addition to the measure of secondary-school success just described, a more precise measure of what has been learned during the high-school period was obtained. During the years covered by this study, the Iowa High School Content Examination has been administered to all entering freshmen at Marquette. This examination consists of four parts: English, mathematics, science, history and social science. Both the total score on the test, and the scores on the individual sections, were available for each student whose record was used in this study.

*Psychological Examination.*—To furnish a more general measure of college aptitude, the Thurstone Psychological Examination, published in a new edition each year by the American Council on Education, was also administered to all entering students. There was recorded for each freshman not only the total score on the test, but also the scores on the five separate parts; namely, completion, arithmetic, artificial

language, analogies, and opposites. Variations in difficulty on the several forms of the test were eliminated by establishing the 1936 edition as the standard form and reducing all other scores to this standard through the use of the transmutation formula:

$$X_1 = M_1 + \frac{\sigma_1}{\sigma_2}(X_2 - M_2)$$

## Procedure

This study was begun in the Spring of 1935, when data on the criterion—success in first semester—and on the three predictive measures were available for the freshmen entering in the Fall of 1934. At that time, a few simple regression equations were computed, in the attempt to predict academic success. In the Summer and Fall of 1936, when data were available for freshmen entering in 1934 and 1935, the study was carried further as part of the Project in Research in Universities, sponsored by the United States Department of the Interior, Office of Education, under a W. P. A. grant.[1] In the Fall of 1937 the data for the freshmen entering in 1936 were added, and all relationships were redetermined on the basis of the total group. In the Spring of 1938, when data for the class entering in 1937 were available, these were added, and the entire group of four entering classes were used as the basis of new computations.

The steps of procedure used on the data of 1934–1935, 1934–1936, and 1934–1937, are essentially the same, and are as follows, carried out for each school separately:

(1) The correlations between the criterion and the three predictive measures and the intercorrelations between the measures were computed.

(2) The multiple correlation between the criterion and the three measures was determined.

(3) The correlations between the criterion and each section of the Iowa High-School Content Examination, and the intercorrelations between the measures, were found.

(4) The multiple correlation coefficient between the criterion and the separate sections of the test was computed, to discover if reweighting would increase the accuracy of prediction.

(5) Where the multiple correlation coefficient indicated the advisability of so doing, the regression coefficients of the several sections of the test (or of selected sections) were computed.

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[1] See: *Some Factors in the Adjustment of College Students*, Bulletin 1937, No. 12, U. S. Dept. of the Interior, Office of Education.

(6) The original scores on the sections of the test, for each student involved, were multiplied by the appropriate regression coefficients, and a weighted total obtained.

(7) The correlation between the weighted total and the criterion was computed.

(8) Steps (3), (4), (5), (6), and (7) were repeated for the sections of the Thurstone Psychological Examination.

(9) The intercorrelations between the criterion, rank in high school, and the weighted scores on the tests were computed.

(10) The multiple correlation coefficient between the criterion and the same three measures was obtained.

(11) The regression coefficients were computed, to predict the criterion on the basis of these three measures.

(12) The scores for each individual pupil were multiplied by the appropriate regression coefficients, the constant term added, and the predicted grade was obtained.

(13) The correlation between actual grade and predicted grade was computed.

(14) The weightings found were applied to the scores for the next entering freshman class, and a prediction of grade first semester was obtained.

(15) The predicted grade was later correlated with actual grade earned.

The number of cases and the extensive amount of computation required to determine the various correlations, multiple correlations, and regression equations necessitated the use of labor saving devices. All data were placed on eighty-column punched cards and analyzed by means of Hollerith tabulating equipment.

## RESULTS

*Correlations between Criterion and Predictive Measures.*—Table I presents the coefficients of correlation between the criterion, grade first semester, and the three predictive measures used. In this table, as in the succeeding ones, the data for successive years have been combined cumulatively, and presented in the same table to facilitate comparison. The correlations shown in the table indicate that, while there is some fluctuation, the relationships are, in general, of about the same order for the same measures and the same college. The most serious discrepancies are found for the College of Journalism. For those freshmen entering in 1934 and 1935, the correlation between rank in high school and the criterion was .604; when the next entering

class was included, this decreases to .507. For the same group the correlation between the criterion and the score on the high-school content examination for 1934 and 1935 was .436; when two more entering classes are included, this is reduced to .340. In no other case is the variation as wide as .06, and in many cases it is less than .02.

TABLE I.—CORRELATION BETWEEN THE CRITERION OF ACADEMIC SUCCESS, AND THE THREE PREDICTIVE MEASURES

| Years | Number of cases | Correlation with grade first semester | | | |
|---|---|---|---|---|---|
| | | Rank in high school | High-school content examination | Psychological examination | Multiple correlation with grade first semester |
| **College of Business Administration** | | | | | |
| 1934–1935 | 111 | .474 | .476 | .487 | .605 |
| 1934–1936 | 198 | .503 | .466 | .489 | .616 |
| 1934–1937 | 289 | .471 | .467 | .469 | .589 |
| **College of Engineering** | | | | | |
| 1934–1935 | 132 | .598 | .475 | .516 | .642 |
| 1934–1936 | 218 | .607 | .533 | .528 | .673 |
| 1934–1937 | 333 | .553 | .550 | .519 | .664 |
| **College of Journalism** | | | | | |
| 1934–1935 | 72 | .604 | .436 | .526 | .701 |
| 1934–1936 | 105 | .507 | .410 | .473 | .614 |
| 1934–1937 | 161 | .531 | .340 | .462 | .609 |
| **College of Liberal Arts** | | | | | |
| 1934–1935 | 375 | .568 | .479 | .533 | .651 |
| 1934–1936 | 547 | .578 | .467 | .535 | .657 |
| 1934–1937 | 750 | .559 | .472 | .525 | .649 |

*Multiple Correlations.*—All of the intercorrelations of the four variables for each school for each year were also found. From these intercorrelations there were obtained enough of the partial coefficients to make possible the computation of the coefficients of multiple correlation, which are shown in the last column of Table I. These multiple correlations indicate the accuracy of prediction which should be expected if the scores on the three predictive measures for each student involved were each multiplied by the appropriate regression coefficient.

It will be noted that in most cases an appreciable improvement is obtained over the best single predictive measure. The least improvement is found for the College of Engineering, for 1934–1935, in which case the multiple coefficient is .642 and the correlation with rank in high school alone is .598. For the College of Business Administration, the improvement over the best single measure for the three sets is .118, .111, and .118, respectively. For the College of Engineering, it is .044, .066, and .111; for the College of Journalism, .097, .100, and .068; for the College of Liberal Arts, .083, .079, and .090.

The remainder of the work of this study consists in an attempt to improve the accuracy of prediction over that which would be expected through the simple weighting by regression coefficients of the total scores on the two tests and rank in high school, as indicated by the multiple correlation coefficients of Table I.

## Weighting the Parts of the Iowa High-School Content Examination

Since the scores on the separate parts of the Iowa High School Content Examination were available for each subject in this study, the correlations between the score on each section and the criterion, as well as all intercorrelations, were also computed. The correlations between the parts of the test and grade first semester are shown in Table II; the intercorrelations for this and other sets of data in the report have been omitted for lack of space. These intercorrelations were used at this point to obtain sufficient partial correlations to permit the computation of the multiple correlation coefficients for each group. These multiple coefficients, shown in the last column of Table II, indicate the relationship which should be expected between the criterion and a total score on the test obtained by applying the best weighting to each individual score.

*College of Business Administration.*—It will be observed that for each of the three sets of correlations the relationship between the criterion and the separate parts of the test is very similar. Since no part or parts of the test have either an exceptionally high or exceptionally low correlation with the criterion, it is not to be expected that reweighting would materially increase the relationship. The multiple correlation coefficients verify this assumption: the one for the total group, 1934–1937, being exactly the same as the correlation with the unweighted score, and the other two being somewhat lower. Consequently, it was decided to use the unweighted total score on this test for this group of students.

*College of Engineering.*—The correlations for this group of students, on the other hand, indicate that there is a materially better relationship between the criterion and the scores on the mathematics and the science sections of the test than is found for the English and the

TABLE II.—CORRELATION BETWEEN THE CRITERION OF ACADEMIC SUCCESS, AND THE SEPARATE PARTS OF THE IOWA-SCHOOL CONTENT EXAMINATION

| Years | No. | Correlation with grade first semester | | | | | |
|---|---|---|---|---|---|---|---|
| | | English | Mathematics | Science | History | Total | Multiple *R* |
| **College of Business Administration** | | | | | | | |
| 1934–1935 | 111 | .378 | .377 | .289 | .376 | .476 | .467 |
| 1934–1936 | 198 | .341 | .355 | .303 | .373 | .466 | .443 |
| 1934–1937 | 289 | .346 | .332 | .346 | .355 | .467 | .467 |
| **College of Engineering** | | | | | | | |
| 1934–1935 | 132 | .358 | .517 | .428 | .248 | .475 | .569 |
| 1934–1936 | 218 | .343 | .561 | .502 | .303 | .533 | .613 |
| 1934–1937 | 333 | .353 | .569 | .462 | .298 | .550 | .607 |
| **College of Journalism** | | | | | | | |
| 1934–1935 | 72 | .466 | .230 | .155 | .495 | .436 | .523 |
| 1934–1936 | 105 | .448 | .232 | .132 | .413 | .410 | .478 |
| 1934–1937 | 161 | .437 | .178 | .125 | .294 | .430 | .439 |
| **College of Liberal Arts** | | | | | | | |
| 1934–1935 | 375 | .412 | .427 | .283 | .317 | .479 | .503 |
| 1934–1936 | 547 | .457 | .352 | .275 | .298 | .467 | .481 |
| 1934–1937 | 750 | .467 | .394 | .279 | .296 | .472 | .511 |

history sections. In fact, for each group, the correlation with the mathematics section alone is larger than for the total unweighted score on the content examination. However, in each case the multiple correlation coefficient is also larger than the correlation with mathematics alone.

When the computations were made for students entering in 1934 and 1935, which was done in 1936, all four sections of the test were used in obtaining the regression equations. When the computations were made including students entering in 1936, and again including

those entering in 1937, it was observed that the partial correlation coefficients between the criterion and English with the other three held constant, and between the criterion and history with the other three held constant, were extremely low. Consequently, the multiple correlation coefficients, predicting the grade first semester in terms of scores on the mathematics and the science tests only, were computed. For the 1934–1936 group, this reduced the multiple correlation only from .613 to .612; and for the 1934–1937 group, only from .607 to .605. It was, therefore, decided that the inclusion of the English and the history scores did not make a significant addition to the accuracy of prediction, and the regression equations were based on mathematics and science only.

*College of Journalism.*—From the correlations for this group of students, it is clear that the scores on the mathematics and the science sections of the test have little predictive value. The relationship between the criterion and the score in English is consistently high. For those freshmen entering in 1934 and 1935 there is also a high correlation with score in history. However, in the later groups this is very much lower, so that for the combined group, from 1934 to 1937, the correlation is only .294.

In the computations made in 1936, covering freshmen entering in 1934 and 1935, the entire regression equation, including all four test scores, was obtained. However, the regression coefficient for science became zero, to the fourth decimal place. While the coefficient for mathematics was very small, it was still included. For the entire group, including those entering in 1937, it is observed that the multiple correlation coefficient is practically the same as the coefficient for English alone. While for the 1934–1936 group the score in history still retains some significance, the multiple correlation coefficient including all four measures is only .03 higher than the correlation for English alone. Consequently, for these two groups the English score was used in place of any weighted score for the content examination.

*College of Liberal Arts.*—For the students in this college, it is found that, in general, the score on the English section of the test has the most significant value in prediction. In the first set of correlations given, for 1934 and 1935, the mathematics section is somewhat more significant in its relationship, but for later groups this correlation becomes much lower. In the work done in 1936, covering those freshmen entering in 1934 and 1935, the complete regression equation was computed and used, in spite of the fact that the score in science entered the equation with a slightly negative coefficient. For the two

later sets of correlations, it was found that the multiple coefficients obtained by using the scores in English and mathematics were exactly the same as those obtained with all four measures—.481 for 1934–1936.

TABLE III.—CORRELATION BETWEEN THE CRITERION OF ACADEMIC SUCCESS AND THE WEIGHTED SCORES ON THE IOWA HIGH-SCHOOL CONTENT EXAMINATION, CONTRASTED WITH CORRELATION BETWEEN THE CRITERION AND THE ORIGINAL UNWEIGHTED SCORES, AND THE MULTIPLE CORRELATION, BASED ON ALL PARTS OF THE TEST

College of Business Administration

| Years | Correlation with grade first semester | | |
|---|---|---|---|
| | Unweighted total score, content examination | Multiple correlation, separate parts | Total score, with parts weighted |
| 1934–1935 | .476 | .467 | .476[1] |
| 1934–1936 | .466 | .443 | .466[1] |
| 1934–1937 | .467 | .467 | .467[1] |
| **College of Engineering** | | | |
| 1934–1935 | .475 | .569 | .567 |
| 1934–1936 | .533 | .613 | .613[2] |
| 1934–1937 | .550 | .607 | .609[2] |
| **College of Journalism** | | | |
| 1934–1935 | .436 | .523 | .516 |
| 1934–1936 | .410 | .478 | .448[3] |
| 1934–1937 | .430 | .439 | .437[3] |
| **College of Liberal Arts** | | | |
| 1934–1935 | .479 | .503 | .501 |
| 1934–1936 | .467 | .481 | .493[4] |
| 1934–1937 | .472 | .511 | .490[4] |

[1] Total unweighted score used.
[2] Weighted score based on mathematics and science only.
[3] Unweighted score for English only.
[4] Weighted score based on English and mathematics only.

and .511 for 1934–1937. Consequently, for these two groups the regression equations are based on English and mathematics only.

*Regression Equations.*—The correlations of the various parts of the high-school content examination with the criterion, and the inter-

correlations of these various parts with each other, were used to obtain the regression coefficients which would give the best prediction of grade first semester. As indicated in the previous discussion, it did not seem desirable to weight the parts of the test for the College of Business Administration, since no improvement in prediction could be obtained. For the other colleges, regression equations were found using some or all of the separate sections, in accordance with the conclusions given in previous paragraphs.

*Weighted Scores.*—The regression coefficients were next used to weight the scores on the sections of the test for each student. The total scores obtained by adding together the weighted scores for the various sections of the test were then correlated with the criterion. The resulting coefficients are shown in the last column of Table III, where they are contrasted with the correlations of the original unweighted scores, and also with the multiple correlation coefficients. It is noted that for each of the three groups for the College of Engineering, the correlation with the weighted scores is approximately the same as the multiple correlation. For the College of Liberal Arts, the correlation with the weighted score is approximately the same as the multiple coefficient for 1934–1935, somewhat larger when the next year's class is added, and somewhat less when the last group is included. In every case in which weighting was used, the resulting relationship is better than that found with the simple unweighted total score. The improvement ranges from .018 for Liberal Arts, 1934–1937, to .092 for Engineering, 1934–1935. The coefficients found in the last column of Table III are used in later computations.

## Weighting the Parts of the Thurstone Psychological Examination

The next step consisted in applying the same procedure to the correlations obtained for the various parts of the psychological examination. Table IV shows the correlations of the separate parts with the criterion, for the three groups in each of the four colleges These correlations, together with all of the intercorrelations, were used to compute sufficient partials to make it possible to find the multiple correlation between the parts of the test and the criterion. These multiple correlation coefficients are given in the last column of the table.

*College of Business Administration.*—All parts of the test except the artificial language section are seen to have reasonably high correlations with academic success. This factor disappeared, however,

in only one regression equation, that for 1934–1935. In the equation for 1934–1937 it is so small as to be almost negligible, and could have been omitted without materially affecting the accuracy of prediction. The multiple coefficient in every year shows some improvement over the correlation with unweighted total score.

TABLE IV.—CORRELATION BETWEEN THE CRITERION OF ACADEMIC SUCCESS, AND THE SEPARATE PARTS OF THE THURSTONE PSYCHOLOGICAL EXAMINATION

| Years | No. | Correlation with grade first semester | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Comp. | Arith. | AL | Anal. | Opp. | Total | Multiple *R* |
| **College of Business Administration** | | | | | | | | |
| 1934–1935 | 111 | .424 | .411 | .181 | .317 | .355 | .487 | .543 |
| 1934–1936 | 198 | .411 | .343 | .185 | .312 | .442 | .489 | .528 |
| 1934–1937 | 289 | .380 | .331 | .179 | .317 | .392 | .469 | .481 |
| **College of Engineering** | | | | | | | | |
| 1934–1935 | 132 | .304 | .430 | .394 | .370 | .330 | .516 | .577 |
| 1934–1936 | 218 | .397 | .462 | .387 | .424 | .294 | .528 | .584 |
| 1934–1937 | 333 | .379 | .437 | .336 | .362 | .303 | .519 | .576 |
| **College of Journalism** | | | | | | | | |
| 1934–1935 | 72 | .392 | .466 | .375 | .174 | .421 | .526 | .564 |
| 1934–1936 | 105 | .310 | .372 | .302 | .150 | .420 | .473 | .510 |
| 1934–1937 | 161 | .318 | .266 | .353 | .189 | .388 | .462 | .485 |
| **College of Liberal Arts** | | | | | | | | |
| 1934–1935 | 375 | .335 | .335 | .459 | .314 | .418 | .533 | .554 |
| 1934–1936 | 547 | .360 | .315 | .376 | .312 | .420 | .535 | .554 |
| 1934–1937 | 750 | .375 | .293 | .429 | .291 | .409 | .525 | .539 |

*College of Engineering.*—For the group of students entering this college, it is found that the most significant part of the test is arithmetic. The least significant relationship is found for the opposites test. In each case the multiple correlation indicates an appreciable improvement over the correlation with the unweighted total. For 1934–1936 and 1934–1937, the regression coefficient for the opposites test practically disappeared. Since it was found that the multiple correlation coefficient remained the same when this section of the test was omitted, it was decided to base the equations for those years on the remaining four sections.

*College of Journalism.*—The psychological examination taken as a whole, and also when the parts are reweighted, appears to be of decreasing value as a predictive instrument for the students of this college, as more entering classes are added. The analogies section appears to be especially low in its relationship. However, apparently due to the low correlation between this section and the others, the regression coefficient was positive for all except one group, 1934–1935. And in this same group the regression coefficient for the completion tests, which has a reasonably significant zero-order relationship, also became negative. Since it was found that the omission of these two sections reduced the multiple correlation coefficient only from .510 to .507, the regression equation for that year was based on the remaining three sections.

*College of Liberal Arts.*—From the zero-order coefficients it is clear that the best single predictive instrument in the psychological examination for students in this college is the artificial language test. The next best single measure is furnished by the opposites test. The arithmetic section has become of less value as more cases are added. For each of the three groups the multiple correlation coefficient shows some improvement over the correlation with the unweighted total, but this improvement is not as great as that found for some of the other colleges.

*Regression Equations and Weighted Scores.*—As in the case of the high-school content test, the regression coefficients furnishing the best weighting for the various parts of the psychological examination were computed. These regression coefficients were then applied to the individual scores of the students included in each group, and the resulting weighted scores were obtained. As before, the freshmen entering in 1934 and 1935 were included in all three calculations, and a separate weighted score was found for each, on each of the three occasions when the computations were made. These weighted scores were then correlated with the criterion, yielding the coefficients shown in Table V. It will be noted that in every case except one the weighted scores show a higher relationship with academic success than do the original unweighted scores. For most of the groups the correlation with the scores as actually weighted was not as good as that indicated by the multiple correlation coefficient; in one case it was exactly the same; and in two cases it was slightly better.

## Using the Weighted Scores for Prediction

The final step in the prediction of academic success consists in using the weighted scores for the two tests in combination with rank

in high-school class. The zero-order correlations between these measures and the criterion are shown in Table VI. As before, all of the intercorrelations were also found, and were used to obtain sufficient partial coefficients to make possible the computation of the multiple

TABLE V.—CORRELATION BETWEEN THE CRITERION OF ACADEMIC SUCCESS AND THE WEIGHTED SCORES ON THE THURSTONE PSYCHOLOGICAL EXAMINATION, CONTRASTED WITH THE CORRELATION BETWEEN THE CRITERION AND THE ORIGINAL UNWEIGHTED SCORES, AND THE MULTIPLE CORRELATION

College of Business Administration

| Years | Correlation with grade first semester | | |
|---|---|---|---|
| | Unweighted total score, psychological examination | Multiple correlation, separate parts | Total score, with parts weighted |
| 1934–1935 | .487 | .543 | .518 |
| 1934–1936 | .489 | .528 | .511 |
| 1934–1937 | .469 | .481 | .483 |
| **College of Engineering** | | | |
| 1934–1935 | .516 | .577 | .549 |
| 1934–1936 | .528 | .584 | .584 |
| 1934–1937 | .519 | .574 | .585 |
| **College of Journalism** | | | |
| 1934–1935 | .526 | .564 | .496[1] |
| 1934–1936 | .473 | .510 | .509 |
| 1934–1937 | .462 | .485 | .484 |
| **College of Liberal Arts** | | | |
| 1934–1935 | .533 | .554 | .595 |
| 1934–1936 | .535 | .554 | .549 |
| 1934–1937 | .525 | .539 | .538 |

[1] Since actual weighting did not improve the relationship, the unweighted total score (yielding a correlation of .526) was used in later computations.

correlation. In every case, as was to be expected, this multiple coefficient is larger than any of the three correlations used. The least improvement is that found for the College of Liberal Arts for the 1934–1935 group, in which case the multiple coefficient is .665, or only .070 higher than that for the weighted score on the psychological examina-

tion. The largest amount of improvement is found for the College of Journalism, 1934–1936 group, where the multiple coefficient of .641 is .132 higher than that for the weighted psychological examination. In seven other cases the improvement is as much as .100.

TABLE VI.—CORRELATION BETWEEN THE CRITERION OF ACADEMIC SUCCESS AND RANK IN HIGH SCHOOL, AND THE WEIGHTED SCORES ON THE IOWA HIGH-SCHOOL CONTENT EXAMINATION AND THE THURSTONE PSYCHOLOGICAL EXAMINATION

| Years | No. of cases | Correlation with grade first semester | | | Multiple correlation with grade first semester |
|---|---|---|---|---|---|
| | | Rank in high school | High-school content examination | Psychological examination | |
| **College of Business Administration** | | | | | |
| 1934–1935 | 111 | .474 | .476[1] | .518 | .617 |
| 1934–1936 | 198 | .503 | .466[1] | .511 | .636 |
| 1934–1937 | 389 | .471 | .467[1] | .483 | .589 |
| **College of Engineering** | | | | | |
| 1934–1935 | 132 | .589 | .567 | .549 | .692 |
| 1934–1936 | 218 | .607 | .613 | .584 | .740 |
| 1934–1937 | 333 | .553 | .609 | .585 | .719 |
| **College of Journalism** | | | | | |
| 1934–1935 | 72 | .604 | .516 | .526[1] | .717 |
| 1934–1936 | 105 | .507 | .448[2] | .509 | .641 |
| 1934–1937 | 161 | .531 | .437[2] | .484 | .642 |
| **College of Liberal Arts** | | | | | |
| 1934–1935 | 375 | .568 | .501 | .595 | .665 |
| 1934–1936 | 547 | .578 | .493 | .549 | .664 |
| 1934–1937 | 750 | .559 | .490 | .538 | .658 |

[1] Unweighted score used.

[2] Score for English test only used in place of total score on Content Test.

*Obtaining the Predicted Score.*—The correlations shown in Table VI were next used to compute the regression equations for predicting grade first semester on the basis of rank in high school and the two weighted test scores. These regression coefficients were then applied to the appropriate scores for each individual student involved, and to the total was added the corresponding constant term of the equation.

There thus resulted for each student in each group a predicted grade, of the same order of magnitude as the actual grades, as determined by the regression equation of the particular group. These predicted grades were then correlated with actual grade, and the resulting coeffi-

TABLE VII.—ACTUAL CORRELATION BETWEEN THE CRITERION AND PREDICTED GRADE OBTAINED BY WEIGHTING, CONTRASTED WITH MULTIPLE CORRELATION BASED ON UNWEIGHTED AND ON WEIGHTED SCORES

College of Business Administration

| Years | No. | Multiple correlation, grade first semester and unweighted scores | Multiple correlation, grade first semester and weighted scores | Actual correlation between grade first semester and predicted grade obtained by weighting |
|---|---|---|---|---|
| 1934–1935 | 111 | .605 | .617 | .600 |
| 1934–1936 | 198 | .616 | .636 | .624 |
| 1934–1937 | 289 | .589 | .594 | .593 |
| **College of Engineering** | | | | |
| 1934–1935 | 132 | .642 | .692 | .674 |
| 1934–1936 | 218 | .673 | .740 | .716 |
| 1934–1937 | 333 | .664 | .719 | .704 |
| **College of Journalism** | | | | |
| 1934–1935 | 72 | .701 | .717 | .729 |
| 1934–1936 | 105 | .614 | .641 | .650 |
| 1934–1937 | 161 | .609 | .642 | .649 |
| **College of Liberal Arts** | | | | |
| 1934–1935 | 375 | .651 | .665 | .641 |
| 1934–1936 | 547 | .657 | .664 | .665 |
| 1934–1937 | 750 | .649 | .658 | .658 |

cients are presented in Table VII, together with the multiple correlation coefficients of the original unweighted scores, and those based on the weighted scores.

## Composite Regression Equations

In order to avoid double multiplication of some of the factors, composite regression equations were prepared. It will be remembered

that in the work up to this point, it was necessary to multiply the particular sections of the tests which were used by the appropriate regression coefficients to obtain a weighted score. These weighted scores for the two tests were then multiplied again by their appropriate regression coefficients. If the coefficients for the particular sections are first multiplied by the coefficients for the total weighted test, it will be possible to effect the complete weighting of the actual scores on those sections at one multiplication. Therefore, the regression coefficients for the sections of the tests were multiplied by the corresponding coefficients for the weighted tests. The resulting composite weightings obtained in any year are to be applied to the scores of freshmen entering in the following Fall.

*Relative Importance of the Measures.*—In order to obtain a clearer idea of the relative importance of each of the measures in the various groups in the several schools, the data of Table VIII were prepared. The composite weightings described in the preceding paragraph were multiplied by their corresponding mean values; the resulting quantities were added, and then each was reduced to a percentage of the total. Thus Table VIII indicates the percentage of the total predicted grade that was contributed by each measure used in the prediction.

Some very distinctive differences between the various schools are evident from a casual examination of Table VIII. Thus, rank in high school contributes approximately one-fourth of the prediction for the Colleges of Business Administration and Engineering. For the other two schools, except Liberal Arts, 1934–1935, this measure contributes approximately one-third of the total prediction. The high-school content examination also contributes approximately one-third of the prediction for students in the College of Journalism, and slightly over one-third for those in Business Administration. For Engineering students, on the other hand, this test makes up over one-half of the prediction for the first two groups, and nearly one-half when all groups are combined in the data for 1934–1937. For students entering the College of Liberal Arts this examination has had a varied record, contributing thirty-nine and two-tenths per cent of the prediction in 1934–1935, nineteen and two-tenths per cent in 1934–1936, and twenty-two and three-tenths per cent in 1934–1937.

The psychological examination is the most important predictive instrument for the College of Liberal Arts, except in 1934–1935, and even then it contributed thirty-seven and seven-tenths per cent to the total. As the group increased in number, this test made up forty-three per cent of the prediction. On the other hand, it is of much less value

TABLE VIII.—PERCENTAGE OF THE PREDICTED GRADE CONTRIBUTED BY EACH MEASURE USED

College of Business Administration

| | 1934–1935 | 1934–1936 | 1934–1937 |
|---|---|---|---|
| Rank in high school | 25.4 | 28.0 | 27.0 |
| High-school content examination | (34.2) | 36.9 | 36.9 |
| English | 9.9 | | |
| Mathematics | 12.2 | | |
| Science | 1.4 | | |
| History | 10.7 | | |
| Psychological examination | (40.4) | (35.1) | (36.1) |
| Completion | 12.1 | 8.3 | 9.6 |
| Arithmetic | 10.8 | 8.0 | 7.1 |
| Artificial language | 3.0 | .... | 1.1 |
| Analogies | 6.7 | 5.3 | 8.5 |
| Opposites | 7.8 | 13.5 | 9.8 |
| **College of Engineering** | | | |
| Rank in high school | 27.8 | 27.1 | 27.8 |
| High-school content examination | (55.8) | (53.0) | (48.7) |
| English | 9.3 | | |
| Mathematics | 25.4 | 31.4 | 32.5 |
| Science | 14.5 | 21.6 | 16.2 |
| History | 6.6 | | |
| Psychological examination | (16.4) | (19.9) | (23.5) |
| Completion | 2.0 | 4.3 | 5.5 |
| Arithmetic | 5.1 | 5.9 | 6.2 |
| Artificial language | 3.8 | 2.9 | 5.1 |
| Analogies | 4.8 | 6.8 | 6.7 |
| Opposites | 0.7 | | |
| **College of Journalism** | | | |
| Rank in high school | 35.3 | 31.9 | 33.7 |
| High-school content examination | (29.6) | (34.5) | (32.5) |
| English | 12.3 | 34.5 | 32.5 |
| Mathematics | 1.8 | | |
| Science | | | |
| History | 15.5 | | |
| Psychological examination | 35.1 | (33.6) | (33.8) |
| Completion | .... | .... | 1.5 |
| Arithmetic | .... | 7.9 | 1.9 |
| Artificial language | .... | 5.2 | 9.1 |
| Analogies | .... | .... | 3.5 |
| Opposites | .... | 20.5 | 17.8 |
| **College of Liberal Arts** | | | |
| Rank in high school | 23.1 | 37.8 | 34.7 |
| High-school content examination | (39.2) | (19.2) | (22.3) |
| English | 16.8 | 14.5 | 15.4 |
| Mathematics | 17.2 | 4.7 | 6.9 |
| Science | −0.3 | | |
| History | 5.5 | | |
| Psychological examination | (37.7) | (43.0) | (43.0) |
| Completion | −0.6 | 4.3 | 6.4 |
| Arithmetic | 6.8 | 2.4 | 4.4 |
| Artificial language | 14.4 | 17.9 | 13.0 |
| Analogies | 4.6 | 5.2 | 5.1 |
| Opposites | 12.5 | 13.2 | 14.1 |

in the College of Engineering, but seems to be increasing in significance, changing from sixteen and four-tenths per cent in 1934–1935 to twenty-three and five-tenths per cent in 1934–1937. For Journalism students the contribution of this test was approximately one-third of the total, except in 1934–1935, when it was twenty-nine and two-tenths per cent. For Business Administration it also made up something over one-third of the total prediction.

Even more striking differences may be found among the separate parts of the tests. Thus, for 1934–1936 and 1934–1937, the mathematics section alone is the best single predictive measure for freshmen entering the College of Engineering, making up thirty-two and five-tenths per cent of the total of the largest group. This same test is of entirely negligible value for students of Journalism, contributing only one and eight-tenths per cent in 1934–1935. For Liberal Arts, this section of the test has decreased in value, contributing seventeen and two-tenths per cent in 1934–1935, but only four and seven-tenths per cent for 1934–1936. The English section of the examination by itself furnishes the most significant predictive measure for freshmen in Journalism in 1934–1936, constituting thirty-four and five-tenths per cent of the total. For the larger group in 1934–1937 its contribution is nearly as great. This is also an important section of the test for freshmen in Liberal Arts. On the other hand, for freshmen in Engineering, the English section made up only nine and three-tenths per cent of the total in 1934–1935, and in the other two groups its contribution was so small that it could be omitted without materially affecting the multiple correlation coefficient.

The science section of the test, also, is important only for the College of Engineering. For Business Administration, it contributed only one and four-tenths per cent of the total in 1934–1935. For Journalism, it made a zero contribution in 1934–1935, when all measures were included in the computation of the regression equations; and in the same year it was slightly negative in its contribution to prediction of success in Liberal Arts. For the rest, it has been omitted from the equations of all schools except Engineering. On the other hand, the history section of the test made a fairly large contribution to the prediction for both Business Administration and Journalism in 1934–1935; thereafter it was not included as a separate measure. It made only a small contribution for Engineering and Liberal Arts in 1934–1935, and could be omitted from the equations for both schools thereafter without affecting the multiple correlation coefficient.

Of the sections of the psychological examination, the opposites test seems to have the widest value, being of considerable importance to prediction in all schools except Engineering, where it is entirely negligible. The artificial language test is of considerable value in prediction for Liberal Arts; of fair value for Journalism, especially for the last group; of very slight value for Engineering; and of negligible value for Business Administration. The completion section contributed twelve and one-tenth per cent of the total prediction for Business Administration, 1934–1935, and was of considerable importance for later groups. It is of slight but increasing value in Engineering; varied from slightly negative in 1934–1935 to six and four-tenths per cent in 1934–1937 for Liberal Arts; and was negligible throughout for Journalism. The analogies test varied in its contribution from five and three-tenths per cent to eight and five-tenths per cent for Business Administration; from four and eight-tenths per cent to six and eight-tenths per cent for Engineering; from four and six-tenths per cent to five and two-tenths per cent for Liberal Arts; and was negligible for Journalism, except in the last year when its contribution was still only three and five-tenths per cent.

The point that stands out most clearly from the above analysis of the data of Table XII is that the several measures are decidedly uneven in their predictive values when applied to students entering the various colleges. To use exactly the same weighting for all sections of a particular test, for all freshmen, even though the total score on the test itself is then given a weighting according to a simple regression equation, should not be expected to furnish as accurate prediction as the type of differential weighting herein described. Whether the increase in accuracy which can be achieved is sufficient to justify the effort involved is not entirely clear on the basis of the results so far obtained.

## Use in Actual Prediction

The regression equations based on data for 1934 and 1935 were applied to those freshmen who enrolled in the Fall of 1936, and the 1934–1936 equations were applied to freshmen entering in 1937. This article has been concerned chiefly with determining the variation in predictive value of the various measures for the four different types of undergraduate curricula, within the limits of the predictive instruments considered. While a complete analysis of the predictions already made would extend the discussion unduly, it is, nevertheless, in order to mention briefly some of the results obtained.

In general, the average amount of difference between predicted and actual grade has been about 0.3 grade point. There have been, of course, a number of cases of differences greater than 1.0 grade point—probably many of these could be explained by a careful examination of the individual circumstances. The number of differences beyond 0.6 grade points, however, has not been great enough to cause undue concern. For a surprising number of individuals the difference was less than 0.1 grade point, and variations of 0.03 grade point or less are by no means rare. Unfortunately, as is common in such instruments, the predictions are less accurate at the extremes, where they would be of the greatest value.

The correlations between predicted and actual grade for the freshmen entering in 1937, using the 1934–1936 formulas, were: Business Administration, .580; Engineering, .650; Journalism, .481; Liberal Arts, .625. Using the 1934–1937 formulas (which included this entering class) the correlations were: Business Administration, .584; Engineering, .649; Journalism, .656; Liberal Arts, .631. The 1934–1937 formulas were used to predict the grades for freshmen entering in 1938. The correlations between these predicted grades and actual grades were: Business Administration, .628; Engineering, .732; Journalism, .586; Liberal Arts, .620.

## CONCLUSIONS

(1) The various sections of the Iowa High-School Content Examination, and of the Thurstone Psychological Examination, vary significantly in their predictive value for the four undergraduate curricula of Business Administration, Engineering, Journalism, and Liberal Arts. The variation is so wide that a particular section which furnishes the best single predictor for one college may be entirely negligible in its contribution for another.

(2) By including rank in high school and the weighted scores on the two tests, it is possible to obtain a better prediction than could be made with rank in high school and the unweighted scores on the tests. Whether the improvement so far found is sufficient to justify the effort is not clear.

(3) Regression equations based on previous classes, when applied to newly enrolled freshmen, result in predictions which are, on the average, within 0.3 grade point of the actual grade earned.

# A STUDY OF THE VALUE OF HIGH-SCHOOL LITERATURE COURSES

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That there has been a great deal of agitation in the whole field of education concerning the aims, the methods, and the scope of the work of the school is evident to the most casual observer. This is particularly true of courses in English literature, especially English literature courses in the junior high school and more advanced levels. Considerable progress has been made in the elementary schools in the methods used in teaching reading and in the selection of the material to be read. No longer is it true that pupils in the lower grades are tortured by attempts to make them read material far beyond their comprehensions. This improvement has not come about by chance, but has resulted from the detailed and patient work of investigators who have determined what the average child in the third grade, for instance, can or cannot be expected to understand.

In the educational levels above the elementary schools, however, comparatively little work of this kind has been done. Over the decades there have been certain set requirements in English literature for the high schools and the universities, but little scientific research has been done to show either the necessity for such courses or the results which they have produced. The necessity for the use of the particular materials which make up the contents of these courses has been subjected to little objective study. Certain novels, poems, plays, and essays have been included in these courses, not because it was known as a scientifically determined fact that they should be included, but because they happened to be the favorites of the persons doing the selecting.

The value of presenting courses in English literature has even been called into question. That there is sufficient reason for their having a somewhat prominent place in the average high-school or college curriculum is not open to serious doubt, but it seems strange that the field of investigation has not produced more objective information which would justify not only the courses themselves but the materials of the courses and the methods used in teaching them.

Literature is one form of language. The functions of language are not numerous, but they make up a large part of the life of any indi-

vidual or of any group. Few people appreciate at all fully the function of language in the clarification and speeding up of thought. A person thinks in words. What he can express clearly in words he has thought out clearly. The reverse of this is also true. What one expresses in words, others can check for accuracy, definiteness, and organization.

Literature is a written record of man's inner life, his relations with others, and his reactions to environment. There is no literature in which fewer than two people communicate with one another; and almost always there are the hosts of imaginary people, who represent public opinion and the forces of social approval and disapproval, in addition to the real people who speak or write to or for the reader. The purpose of all literature is that of teaching someone something which should be useful to him. It is an effort to influence readers in some way by recounting the experiences of others.

This paper presents some factual material showing that the knowledge which college freshmen presumably have gained in their high-school English literature courses is limited in amount, is vaguely comprehended, is very slightly related to what they read from choice, and is without much influence on the extent of their reading.

As the present study constitutes an attempt to ascertain the effectiveness of the high-school literature course, it was felt that no better field for securing objective information about such courses could be found than by attempting to determine what lasting effects they had had upon students who had taken them. The subjects for the investigation were members of the freshman class at Oregon State College. As the entire freshman class constituted too large a group to use, the writers believed that a fair sampling of the group would give substantially the same results. Consequently, twenty different classes in English composition were selected as the experimental group. These classes were carefully chosen in order that a satisfactory cross-section of the entire group might be secured.

One class-hour was used in presenting a questionnaire which would give the writers the material needed. To secure uniformity in giving the questionnaire, specific general instructions were read to the classes before they answered the questions. Anonymity of students and the high schools from which they came was promised. The instructors presenting the questionnaire reported a complete willingness on the part of the students to coöperate in making the study.

In the preparation of the questions used in the questionnaire, the writers tried to avoid asking any "leading" questions which might

tempt the students to give the answers they thought were expected of them.

The total number of students who returned usable questionnaires was five hundred forty-two. One hundred eighty-one were female and three hundred sixty-one were male. The mean age was 19.96 ± .08 and the standard deviation was 2.61. These students came, in about equal numbers, from large and from small high schools. Analysis of the results showed no valid relations between the answers to the questionnaire and the sizes of the high schools attended.

The first question, "Do you like to read?," brought the response that five hundred seven students (one hundred seventy-four women and three hundred thirty-three men) claimed to like to read and thirty-seven women and twenty-three men did not. The second question, "Do you prefer to read magazines rather than books?," was answered in the affirmative by two hundred sixty-four students (fifty-seven women, two hundred seven men); in the negative by two hundred twenty-seven (ninety-eight women, one hundred twenty-nine men).

The question, "Do you like teachers' choices of books better than your own?," was answered in the affirmative by eighty-nine students (thirty-two women, fifty-seven men), and in the negative by four hundred eighteen students (one hundred twenty-six women, two hundred ninety-two men). The response to this question needs little comment, for it strikes at the very heart of the matter under consideration. If teachers of literature have failed to convince their pupils of the superiority of the books chosen by them, if they have failed to induce in the students a desire to read good books instead of the ephemeral type of reading which they may naturally prefer, one may logically infer that the teaching has not been very successful.

For the fourth item of the questionnaire, the entire field of literature was arbitrarily divided into eight general classes and the students were asked to rate the eight classes in order of preference on a scale of one to eight inclusive, one being the most preferred and eight the least. The eight classes were: Biography, autobiography, fiction, travel, poetry, drama, essays, and technical books. The results are given in Table I.

An attempt was made to find out what the students filling in the questionnaire thought about their high-school English teachers, not only as teachers but also as persons. Naturally, any such estimate is highly subjective. It was believed, however, that the answer to this question might shed some additional light on the general problem of the value of literature courses. The method of rating used was

TABLE I.—PREFERENCES FOR TYPES OF LITERATURE

| Class of book | Mean | Standard deviation | Frequency of mention |
|---|---|---|---|
| 1. Fiction | 1.753 | 1.35 | 539 |
| 2. Travel | 2.592 | 1.47 | 526 |
| 3. Biography | 4.089 | 1.69 | 491 |
| 4. Autobiography | 4.483 | 1.63 | 460 |
| 5. Drama | 5.073 | 1.94 | 464 |
| 6. Technical books | 5.269 | 2.36 | 492 |
| 7. Essays | 5.669 | 1.71 | 469 |
| 8. Poetry | 6.060 | 1.98 | 464 |

that of having each student grade each English literature teacher under whom he or she had taken work (for some of them had had as many as five English teachers) on a scale of *A*, *B*, *C*, *D*, and *F*. These letters were used because they are the terms in which student grades are given at Oregon State College and the students, presumably, would most readily understand their significance. The letters were converted to 1, 2, 3, 4, and 5 for tabulating convenience. On this basis, the students rated their high-school English literature teachers as shown in Table II.

TABLE II.—RATINGS OF FORMER HIGH-SCHOOL ENGLISH TEACHERS

| | Mean | SD | Frequency |
|---|---|---|---|
| As to teaching ability | 2.178 | 1.05 | 1182 |
| As to personality | 2.096 | 1.13 | 1137 |

Analysis of the data shows that the teachers were rated in the same way by the better students and the poorer students; and by those from the larger and from the smaller high schools. It may be seen that the teachers were given a higher rating on personality than on teaching ability.

To the question, "What newspapers do you read regularly?," the answers showed that almost eleven per cent of the papers read were the home-town papers and the College daily. Twelve students claimed to read no newspapers at all, while eight read only the College paper.

In an attempt to find out which sections of the newspaper were read by students and which sections of the paper were preferred, the following question was asked: "What sections of the newspaper do

you usually read? Indicate your order of reading them by numbering the blanks below. If you do not read any of these sections, do not number them. Add any sections not listed which you do read.

( ) radio. ( ) moving pictures. ( ) sports. ( ) headlines only.
( ) comics. ( ) _____. ( ) _____. ( ) _____."

This listing was made incomplete purposely. It was believed that if such sections of the paper as general news stories, editorials, etc. were listed, some students might feel that they should claim them as being read, when, in fact, they were not being read. On the other hand, a regular reader of the news section would almost certainly write in "news section" in one of the blank spaces. The results

TABLE III.—PARTS OF NEWSPAPERS IN ORDER READ

| Section of paper | Mean | SD | Frequency |
|---|---|---|---|
| Headlines only | 1.898 | 1.10 | 362 |
| Comics | 2.260 | 1.13 | 508 |
| Front page | 2.437 | 1.03 | 98 |
| Sports | 2.739 | 1.63 | 436 |
| News[1] | 3.974 | 1.81 | 193 |
| Radio | 3.196 | 1.40 | 240 |
| Editorials | 3.711 | 1.71 | 135 |
| Moving pictures | 4.014 | 1.27 | 287 |
| Special articles | 5.9 | .... | 35 |
| Society | 3.5 | .... | 34 |
| Homemaking | 2.5 | .... | 28 |
| Magazine section | 4.4 | .... | 19 |
| Financial | 4.6 | .... | 18 |
| Advertisements | 4.0 | .... | 15 |
| Locals | 3.0 | .... | 14 |
| Continued stories | 3.0 | .... | 9 |
| Vital statistics | 6.0 | .... | 7 |
| Advice to the lovelorn | 3.8 | .... | 6 |
| Crossword puzzles | 3.7 | .... | 4 |
| Bridge | 4.0 | .... | 1 |
| Letters to the editor | 1.0 | .... | 1 |
| Automobile section | 6.0 | .... | 1 |
| Gardening | 3.0 | .... | 1 |
| Music and art | 7.0 | .... | 1 |

[1] There is considerable overlapping in the divisions of "Front Page," and "News," but this could not be definitely avoided. It may be noticed that the headings "News," "Front Page," and "Editorials" were written in many times.

TABLE IV.—MAGAZINES LISTED IN ORDER OF FREQUENCY OF MENTION

| | |
|---|---|
| Readers Digest | 267 |
| Colliers | 243 |
| American | 217 |
| Saturday Evening Post | 189 |
| Time | 174 |
| Life | 144 |
| Esquire | 140 |
| Cosmopolitan | 84 |
| Good Housekeeping | 81 |
| McCalls | 70 |
| National Geographic | 68 |
| Ladies Home Journal | 45 |
| Popular Mechanics | 42 |
| Literary Digest | 38 |
| Red Book | 36 |
| Popular Science | 35 |
| Vogue | 33 |
| Delineator | 30 |
| Harper's Bazaar | 26 |
| Country Gentleman | 25 |
| Liberty | 25 |
| Harpers | 24 |
| Coronet | 18 |
| Woman's Home Companion | 18 |
| Field and Stream | 16 |
| American Boy | 15 |
| Atlantic Monthly | 15 |
| Pictorial Review | 15 |
| Fortune | 14 |
| Outdoor Life | 10 |
| Scientific American | 9 |
| Current History | 8 |
| Hunting and Fishing | 8 |
| Forum | 7 |
| News Week | 7 |
| American Home | 6 |
| Oregon Farmer | 5 |
| Popular Homecraft | 5 |
| Timberman | 5 |
| Travel | 5 |
| Adventure | 4 |
| Blue Book | 4 |
| Pathfinder | 4 |
| Q.S.T | 4 |
| Sport Stories | 4 |
| Spur | 4 |
| Sunset | 4 |
| True Story | 4 |

apparently bear out this reasoning. The order in which the parts of the newspaper were read is shown in Table III. No attempt has been made to show the standard deviation when the frequency was less than fifty, as this was not considered significant.

The writers attempted to get expressions from the students of the order in which they preferred the magazines which they read but found that, as many students merely listed the names of the magazines without expressing preference, this was impossible. Consequently the

TABLE V.—BOOKS READ IN THE SUMMER JUST PRECEDING THIS STUDY

| | |
|---|---|
| Anthony Adverse | 31 |
| The Magnificent Obsession | 15 |
| The Good Earth | 12 |
| The Green Light | 11 |
| Mutiny on the Bounty | 11 |
| 100,000,000 Guinea Pigs | 10 |
| Royal Road to Romance | 8 |
| White Fang | 6 |
| Les Miserables | 6 |
| Trail of the Lonesome Pine | 6 |
| Anna Karenina | 5 |
| The Flying Carpet | 5 |
| Freckles | 5 |
| Girl of the Limberlost | 5 |
| A Lantern in Her Hand | 5 |
| Sea Wolf | 5 |
| The Three Musketeers | 5 |
| All Quiet on the Western Front | 4 |
| Forgive Us Our Trespasses | 4 |
| The Harvester | 4 |
| It Can't Happen Here | 4 |
| Jalna | 4 |
| Microbe Hunters | 4 |
| Oil for the Lamps of China | 4 |
| The Tale of Two Cities | 4 |

study of this particular item was limited to a numerical study of the various magazines named. These magazines, listed in their order of frequency of mention down to three are given in Table IV.

In an attempt to find out what the reading tastes of this group of students were, the question "What books did you read last summer?" was asked. It was not expected that this question would provide a complete list of all the books read by all of these students. It was expected that it would, probably, be a list of all the books read by these students for which they could remember titles. It is entirely

possible to read a book and forget its title within five months. This may be particularly true for anyone who reads many books; but when a student admits having read only one book and cannot remember either the title of that book or the name of the author, it is certainly an indication that he has not derived much benefit from his reading. And when, as happened frequently, the student claimed that he had read as many as ten books either during the last Summer or during the first quarter of the current college year and could not remember the name of any book or author, this inability to retain such facts is even more striking.

However, the more important fact aimed at in this question was to find out just what books which were read were remembered. A listing of such books is indicative of the quality of the students' interests and tastes in reading. The books most read (down to three mentions) during the just preceding Summer were those shown in Table V.

In this connection the total number of different books listed was five hundred fifty-one; the total number of books read by the whole group was eight hundred twenty-eight or about a book and a half for each student in the group.

As many students of Oregon State College work long hours each day during the Summer, it was believed that they might have more opportunity to read during the college year than during the Summer and that more books would be available to them during the college year. For this reason the question, "What books were read during the first term of this school year?," was asked. It should be pointed out that the English department makes a determined effort during the college year to influence and encourage reading by students, particularly that reading which is done outside of regular course work. Although, as expected, more books were read, not much difference can be seen in the kinds of books read at the College and those read during the Summer. The most popular books, listed down to three mentions, are given in Table VI.

Under this question eight hundred six different titles were listed, the total number of mentions being eleven hundred eighty-five. In addition, the names of fourteen authors were mentioned eighteen times without the titles of the books claimed to have been read being listed.

The students were further asked, "Of all the books you have ever read, which have you liked best?" They were also asked "Why did you like these?" but, as the answers to the latter question were vague and general, it was not considered possible to list them. It was

TABLE VI.—BOOKS READ DURING THE AUTUMN QUARTER BY THE STUDENTS IN THIS STUDY

| | |
|---|---|
| Anthony Adverse | 28 |
| The Good Earth | 23 |
| The Green Light | 19 |
| Microbe Hunters[1] | 18 |
| Gone With the Wind | 16 |
| The Magnificent Obsession | 13 |
| Forgive Us Our Trespasses | 10 |
| Arrowsmith | 10 |
| Smoky | 10 |
| Men Against the Sea | 9 |
| Mutiny on the Bounty | 9 |
| Main Street | 9 |
| 100,000,000 Guinea Pigs | 8 |
| Royal Road to Romance | 8 |
| All Quiet on the Western Front | 7 |
| Lost Horizon | 7 |
| Jungle Peace | 6 |
| North to the Orient | 6 |
| Around the World in Eleven Years | 5 |
| Captain Blood | 5 |
| Come and Get It | 5 |
| Hunger Fighters[1] | 5 |
| It Can't Happen Here[1] | 5 |
| Life of Will Rogers | 5 |
| The Magic Carpet | 5 |
| National Velvet | 5 |
| Pitcairn's Island | 5 |
| Skin Deep | 5 |
| While Rome Burns | 5 |
| White Banners | 5 |
| Cow Country | 4 |
| Edge of the Jungle | 4 |
| The Glorious Adventure | 4 |
| Green Mansion | 4 |
| The Hurricane | 4 |
| The Insect Menace[1] | 4 |
| Jungle Days | 4 |
| A Lantern in Her Hand | 4 |
| A Mind that Found Itself[1] | 4 |
| The Nine Tailors | 4 |
| Oil for the Lamps of China | 4 |
| Scaramouche | 4 |
| Shadows on the Rock | 4 |
| Story of San Michele | 4 |
| The Thin Man | 4 |
| The Three Musketeers | 4 |

[1] Strongly recommended although not required in freshman courses not in the English department.

assumed that certain books which the students had read during their lifetimes would stand out in their minds. It is entirely possible that some books which various individuals enjoyed tremendously would be overlooked in such a listing, but it was believed that a representative number of books that had been enjoyed would be secured from the replies of the entire group. The most popular or the best-liked books are listed in Table VII in the order of their frequency of mention, down to three.

TABLE VII.—BOOKS LIKED BEST BY THE STUDENTS IN THIS STUDY

| | |
|---|---|
| A Tale of Two Cities | 45 |
| Tom Sawyer | 26 |
| The Magnificient Obsession | 25 |
| Les Miserables | 25 |
| Anthony Adverse | 22 |
| The Call of the Wild | 22 |
| Royal Road to Romance | 22 |
| The Good Earth | 19 |
| Treasure Island | 19 |
| Huckleberry Finn | 18 |
| Gone With the Wind | 17 |
| Mutiny on the Bounty | 17 |
| Little Women | 16 |
| David Copperfield | 15 |
| Smoky | 15 |
| White Fang | 15 |
| The Three Musketeers | 14 |
| The Trail of the Lonesome Pine | 14 |
| The Green Light | 13 |
| We | 13 |
| Arrowsmith | 12 |
| Freckles | 12 |
| Microbe Hunters | 12 |
| The Count of Monte Cristo | 11 |
| The Swiss Family Robinson | 11 |
| Captain Blood | 10 |
| A Girl of the Limberlost | 10 |
| A Lantern in Her Hand | 10 |
| The Virginian | 10 |
| Beau Geste | 9 |
| Ivanhoe | 9 |
| Ramona | 8 |
| Moby Dick | 8 |
| Robinson Crusoe | 8 |
| All Quiet on the Western Front | 8 |
| The Bridge of the Gods | 7 |
| 100,000,000 Guinea Pigs | 7 |

TABLE VII.—(*Continued*)

| | |
|---|---|
| The Last of the Mohicans | 7 |
| The Adventures of Sherlock Holmes | 6 |
| Ben Hur | 6 |
| Jalna | 6 |
| 20,000 Leagues Under the Sea | 6 |
| Forgive Us Our Trespasses | 5 |
| The Harvester | 5 |
| The Life of Louis Pasteur | 5 |
| Lorna Doone | 5 |
| New Worlds to Conquer | 5 |
| North to the Orient | 5 |
| Pitcairn's Island | 5 |
| Rainbow Trail | 5 |
| Two Years Before the Mast | 5 |
| Wild Geese | 5 |
| The Life of Edison | 4 |
| Wings | 4 |
| Anna Karenina | 4 |
| Count Lucknow | 4 |
| The Flying Carpet | 4 |
| Lamb in Her Bosom | 4 |
| Little Men | 4 |
| The Little Shepherd of Kingdom Come | 4 |
| Oliver Twist | 4 |
| Riders of the Purple Sage | 4 |
| Sand | 4 |
| Sea Hawk | 4 |
| Uncle Tom's Cabin | 4 |
| Vanity Fair | 4 |
| When a Man's a Man | 4 |

The complete list of books liked best by the students of this study consisted of six hundred eighty-one titles mentioned fourteen hundred fifty-eight times. In addition, forty-eight names of authors received eighty-eight mentions without the titles of the books being listed.

The writers believed that a study of the most disliked books might disclose something of value for the teacher of literature, either in the selection of books to be recommended or in the improved presentation of the material of these books. Because the list is so scattered, it does not yield as much of value as it might. It does, however, contain as large a proportion of books on current lists of recommended books as it does of titles from the older lists of required books. *The Tale of Two Cities* was listed thirteen times, but *Anthony Adverse* was listed ten times. *David Copperfield* was listed six times and *Ivanhoe* four

times, but *The Good Earth* and *Microbe Hunters* were listed four times, also. The list of books most disliked, down to three mentions, is in the following table, Table VIII.

TABLE VIII.—BOOKS MOST DISLIKED BY STUDENTS STUDIED

| | |
|---|---|
| The Tale of Two Cities | 13 |
| Anthony Adverse | 10 |
| David Copperfield | 6 |
| The Good Earth | 4 |
| Ivanhoe | 4 |
| Microbe Hunters | 4 |
| Shakespeare's Works | 6 |

Each student was asked, further, to name his two favorite authors. It was expected that the answers to this question would serve as a partial check on the answers given as to the books best liked; but many students listed authors as favorites without listing any books written by those authors. Nevertheless, the list serves as a fairly clear indication of the types of literature preferred by these students. The most popular authors are listed in Table IX in the order of their frequency of mention, down to four.

The complete list contained one hundred seventy-two names of authors mentioned six hundred fifteen times.

The last direct question about books was the one in which the students were asked to indicate their favorite characters. Many of the students failed to answer this question. It may be possible to judge from this that their reading had had so little effect upon them that they had not made friends of many people in books. That the question would be completely misunderstood by some of the students did not occur to the writers, but the lists compiled show that some of the students listed their favorite moving picture or radio stars. To others, "character" meant a character in a newspaper cartoon or comic strip. The favorite characters are listed in Table X in the order of their frequency of mention, down to three.

The complete list of favorite characters, except for movie and radio stars and comic strip personalities, contained one hundred fifty-three names and three hundred mentions. Fifteen movie and radio personalities received eighteen mentions. Personalities confined to comic strips received three mentions altogether.

The attempt to find out whether or not students liked or disliked the books which they were required or asked to read in their high-school

literature courses was made by asking, "If you don't like 'literary' books or the so-called good literature, will you tell the reasons?" The

TABLE IX.—AUTHORS LISTED AS BEST-LIKED BY STUDENTS STUDIED

| | |
|---|---|
| Zane Gray | 40 |
| Richard Halliburton | 35 |
| Mark Twain | 28 |
| Lloyd Douglas | 26 |
| Charles Dickens | 25 |
| Sinclair Lewis | 22 |
| Jack London | 20 |
| Oliver Curwood | 17 |
| Kathleen Norris | 17 |
| Pearl Buck | 15 |
| O. Henry | 15 |
| Gene Stratton Porter | 15 |
| Alexander Dumas | 13 |
| Rudyard Kipling | 13 |
| Willa Cather | 12 |
| Peter B. Kyne | 12 |
| Rafael Sabatini | 12 |
| Edgar Allen Poe | 11 |
| Temple Bailey | 10 |
| A. Conan Doyle | 10 |
| Clarence B. Kelland | 10 |
| William Beebe | 9 |
| William Shakespeare | 9 |
| P. G. Wodehouse | 9 |
| Edna Ferber | 8 |
| John Galsworthy | 8 |
| William James | 8 |
| Nordhoff and Hall | 8 |
| Mary Roberts Rinehart | 8 |
| Robert Louis Stevenson | 8 |
| Booth Tarkington | 8 |
| Bess Streeter Aldrich | 7 |
| Margaret Mitchell | 7 |
| S. S. van Dyne | 7 |
| Edgar Rice Burroughs | 6 |
| Paul de Kruif | 6 |
| James Fenimore Cooper | 5 |
| Victor Hugo | 5 |
| H. G. Wells | 5 |
| Martin Johnson | 5 |
| Christopher Morley | 5 |

question was purposely phrased in this negative way as it was believed that a student who did enjoy good literature would be more likely to

come to the defense of good books than a student who disliked them but felt that he should conceal this dislike. Thirty-seven students answered this question by saying that they did like "literary" books. In almost every instance, however, such expressions were qualified with words like "some of the time," "occasionally," "except for a few books," or "except for certain authors."

On the other hand, many of the students, as indicated in the following summary, freely expressed the reasons why they did not

TABLE X.—FAVORITE CHARACTERS OF THE STUDENTS STUDIED

| | |
|---|---|
| Scattergood Baines | 14 |
| Anthony Adverse | 11 |
| Tom Sawyer | 11 |
| David Copperfield | 10 |
| Sherlock Holmes | 10 |
| The Saint | 9 |
| Tarzan | 8 |
| Huckleberry Finn | 7 |
| Jean Valjean | 7 |
| Sydney Carton | 6 |
| Philo Vance | 5 |
| Will Rogers | 5 |
| Charlie Chan | 5 |
| Jo | 5 |
| Scarlett O'Hara | 5 |
| D'Artagnan | 4 |
| Freckles | 4 |
| Arrowsmith | 4 |
| Jeeves | 4 |

enjoy reading what may be called "literary" books. The summary indicates an approximation of what the students wrote in their comments. Naturally there was not quite as much uniformity of statement as appears to be indicated by this summary, but it probably presents a clearer picture of the results than an enumeration of the individual statements. If a student took fifty words to express the idea that such books were, for him, dull and dry, it would serve no useful purpose to put that comment as a separate item. Some of these divisions will, of course, tend to overlap but, again, it was believed that a clearer idea of the students' reactions would be presented by preserving a semblance of their original form than by arbitrarily reducing the number of classifications.

Table XI lists, down to three mentions, the reasons offered by the students studied for their dislike of standard books in the field of literature.

TABLE XI.—REASONS OFFERED FOR DISLIKING "LITERARY" BOOKS

| | |
|---|---|
| Too dull and dry | 78 |
| Too hard to understand | 73 |
| Not interesting or entertaining | 52 |
| Not enough action | 35 |
| Don't arouse interest | 16 |
| Too much description | 15 |
| Too wordy | 12 |
| Not true to life | 12 |
| Too boring | 10 |
| Rather read modern books | 10 |
| Too busy to read them | 10 |
| Too many big words | 9 |
| Too ancient | 8 |
| Hate being forced to read | 8 |
| Don't like style | 7 |
| Not old enough to appreciate | 6 |
| Too formal and stilted | 6 |
| Take too long to read | 6 |
| Action too slow | 6 |
| Subjects uninteresting | 6 |
| Too long | 6 |
| Rather read magazines | 5 |
| Not practical enough | 5 |
| Pointless | 5 |
| Waste of time | 4 |
| Not modern enough | 4 |
| Don't like subject-matter | 4 |

Another indirect attempt was made to secure students' criticisms of their high-school literature courses by asking the following question: "If you were teaching literature courses in high school and were free to use any methods and materials which you pleased as long as you interested the pupils, how would your courses differ from those which you took as a pupil?"

The writers have endeavored to organize and classify the answers to this question. Again they wish to point out that it is impossible to give all of the individual answers as no two of them were expressed in exactly the same form. While this complicated the tabulation and made an absolutely exact classification impossible, it was believed that better results have been secured in this way than by listing set ideas and asking the students to express themselves through the predetermined answers they would most readily support. Consequently, the list which is given will show a number of overlapping classes, but it is believed that this gives a more accurate report of the responses obtained.

TABLE XII.—CHANGES SUGGESTED BY STUDENTS FOR HIGH-SCHOOL LITERATURE COURSES

| | |
|---|---|
| Read more modern literature | 82 |
| Eliminate Chaucer and Seventeenth and Eighteenth Century literature | 49 |
| Make English course more interesting | 40 |
| Give freer choice of books to be read | 25 |
| Have more class discussion | 24 |
| Teach more fundamental grammar | 23 |
| Eliminate Shakespeare | 20 |
| Don't try to force every pupil to like literature | 20 |
| Read more interesting books | 19 |
| Write more themes | 17 |
| Eliminate poetry | 16 |
| Let pupils form own opinions: don't try to force instructors' opinions on them | 16 |
| Don't stress memorizing | 15 |
| Have instructor do more explaining to class | 12 |
| Read more books and report on them informally | 11 |
| Encourage optional reading | 10 |
| Don't stress analysis of stories | 10 |
| Have instructor read to class | 9 |
| Teach reading for enjoyment | 9 |
| Have more magazines read | 8 |
| Dramatize more material | 8 |
| Read stories and poems aloud in class | 7 |
| Cover less ground, but have more detailed discussion | 6 |
| Produce shows and movies of books | 6 |
| Teach modern plays | 6 |
| Don't make pupils slave over dates and titles | 5 |
| Teach literature that pupils can understand | 5 |
| Gain interest by showing what the classics have to offer | 5 |
| Teach modern poetry | 4 |
| Teach more biography | 4 |
| Eliminate compulsory book reports | 4 |
| Stress oral composition | 4 |
| Grade themes more strictly | 4 |
| More outside reading, but be sure it is understood | 4 |
| Eliminate "literary" books | 3 |
| Eliminate literature courses | 3 |
| Eliminate use of textbooks | 3 |
| Teach more vocabulary | 3 |
| Read more books of any kind | 3 |
| Use pictures and other illustrative material | 3 |
| Discuss books in class more | 3 |
| Stress ideas more; form less | 3 |
| Teach more informally | 3 |
| Use more interesting material | 3 |
| Outline old material: stress modern literature | 3 |

TABLE XIII.—SELECTED SUGGESTED CHANGES IN HIGH-SCHOOL LITERATURE COURSES

I would not have the pupils make so many illustrated notebooks of stories. Continually looking for pictures does not help one to appreciate a story.

I would not prolong one of Shakespeare's plays for two months.

I would find out what their likes were and select the highest type of literature of that kind. I would try to improve their tastes gradually and give especially interesting literature of other types.

The methods used are all right but the teachers lack personality to put it over clearly so that it will stick.

If I were teaching literature I should have more time given to a thorough understanding of the work covered and the significance of the work discussed. I should also have some reading done for enjoyment.

I would not teach literature as though it were faultless, but have a frank discussion on the author and the plays or essays.

I would read more essays to the pupils, establish a separate course for those who can really write, and have more compulsory reading of interesting, new books.

I don't remember the method my teachers used. I know that my lack of interest in the class was equal to the teachers' and unanimously felt by the whole class.

I would try to understand the pupil's interpretation rather than merely try to make the pupil take some interpretation that the teacher got when she went to school.

I received various methods of being taught. Some methods I thought better than others, but the teacher's personality makes a course.

I would try to blend the grammar with the other work so as to make it as painless as possible. I would cut poetry memorizing to a minimum. I would leave out the two weeks of study of poetic rhythm and add this time to the study of literature.

One can neither write or understand writing until he is unafraid to hand his ideas out where everyone can see them. The development of this courage requires subtle teaching.

I would place before them literature that was suitable for their ages. I wouldn't allow a book of Shakespeare inside the building. Shakespeare would have been killed for me by the high-school teaching I got if it hadn't been explained to me by my parents.

The suggested changes in the teaching of high-school literature courses are listed in Table XII.

The writers believe that the criticisms of some students were of more than ordinary interest and value. Some of these have been selected and may be found in Table XIII.

## SUMMARY

(1) The students in this study, according to their own statements, liked to read; but their concepts of what is meant by the term "like to read" are extremely narrow.

(2) Practically all of the students read some parts of newspapers and some magazines.

(3) Most of these students would rather read magazines than books. There is evidence to indicate that they have not been trained to give the prolonged attention necessary for the appreciation of the longer pieces of literature.

(4) The periodical literature read is mostly of a light and easily read character.

(5) Fiction is the most popular type of literature read, followed rather closely by books of travel; but the type of travel book preferred might almost be considered as a branch of fiction. The students are not particularly interested in technical books, and even less in poetry and essays.

(6) The students would rather choose books for themselves than be guided by the choices of their instructors in literature. This indicates, possibly, two things: (*a*) The literature teachers may not understand the tastes and interests of their pupils as they should, or (*b*) the students are not well enough trained to appreciate the type of books recommended to them by their teachers.

(7) Students apparently read more books during the time spent in college than during the Summer vacation, but there is no evidence to support the belief that the quality of their reading is improved after they have spent a quarter in college.

(8) All students do not like the same books. The books which were listed as being the most popular were, in many cases, the same books which were on other lists as being the most disliked.

(9) The reading interests of these students are not of a very high calibre.

(10) Most of the student disliked the so-called "literary" books and read them only because they were forced to.

(11) Many students were not interested in their high-school literature courses, finding them dull and dry.

(12) It is not possible to draw any definite conclusions from this study about the kind of people who should teach literature courses. It is possible, however, to refute the all too common idea that "anyone can teach English." Literature is a presentation of life, and to teach it as a set of forms instead of a thing to be used, is to defeat the essential purpose of the English literature course. That many of the students represented in this study have failed to find the proper use for literature is all too apparent. Clearly, many of their teachers have failed to teach them literature. Just what qualities teachers must have to succeed cannot be learned from this study, but there is certain indication that further study along this line is necessary.

# A PRELIMINARY STUDY OF THE RELATIONSHIP OF AGE, HOBBIES, AND CIVIL STATUS TO NEUROTICISM AMONG WOMEN TEACHIERS

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This study interprets data concerning two problems: (1) What is the relation of age to emotional adjustment when married and single women teachers are compared; (2) What is the relation of type of hobby to emotional adjustment among teachers? The data analyzed here concern one hundred seventy-three teachers and are taken from a larger study, some other aspects of which have already been reported.[1]

## PREVIOUS STUDIES

Hicks' study[2] reported data indicating a higher degree of neuroticism among single than married teachers. Both single and married teachers were more neurotic than student-teachers. Poorly adjusted teachers had fewer hobbies than well-adjusted teachers.

Phillips' study[3] revealed about the same comparative trends when data on active and prospective teaching groups were analyzed. He also found that both types of teaching groups were significantly more maladjusted than were the student and adult groups upon which the Bernreuter and Bell norms were based. The problem of the relation of age or type of hobby to degree of neuroticism was not treated.

More recently the study of Peck[4] of a teaching group enrolled in the Summer session at the University of Texas substantiated the trends reported in the two studies cited above. In addition, some

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[1] Phillips, W. S.: *An Analysis of Certain Characteristics of Active and Prospective Teachers.* Contrib. Educ., No. 161, Peabody, 1935.

Two unpublished Masters' theses prepared under the supervision of Dr. J. E. Greene, University of Georgia:

Staton, Thomas F.: *The Potential Values of Various Tests of Emotionality and Adjustment in a Student Guidance Program*, 1936.

Teasley, Mildred: *The Relationship Between Tests of Teaching Ability and Standardized Measures of Other Traits*, 1938.

[2] Hicks, Frances R.: *The Mental Health of Teachers.* Contrib. Educ., No. 123, Peabody, 1933.

[3] *Ibid.*

[4] Peck, Leigh: "A Study of the Adjustment Difficulties of a Group of Women Teachers." *Journal of Educational Psychology*, Vol. XXVI, September, 1936, pp. 401–416.

generalizations were made as to the improvement of adjustment with age and experience. However, Peck's sample consists of only sixteen married and nine widowed subjects. No data on hobbies were reported.

## PRESENT INVESTIGATION

The teachers of the present study were in active service in several Georgia communities. Adjustment scores of several types were available as secured by the use of the Bernreuter Personality Schedule and the Bell Adjustment Inventory. The coefficient of correlation between the neurotic tendency scores of the Bernreuter and the total adjustment scores of the Bell was .77 ± .02. Several weeks intervened between administration of the two measures. Neither the items nor scheme of scoring are identical for these two symptom tests.

Data on hobbies were collected on a general information sheet including other data such as age, civil status, and the like. Subjects simply wrote in first and second hobbies in order of most frequent use. The amount of non-response was approximately the same as respects the two adjustment groups used in the analysis that follows.

## RESULTS

1. *Relationship of Age to Neurotic Tendency When Married and Single Women Are Compared.*—Only women subjects were used in this analysis in that norms given for either of the adjustment inventories differed materially for the two sexes. There was a total of fifty-nine married women teachers and eighty-four single women teachers. Chart I presents data using the Bernreuter neurotic tendency scores. The graph lines of this chart show an initial rise in neuroticism among single teachers with the peak at the age level of the thirties. After this period the line declines. Among the married group there is a constant decline which is to be interpreted as an improvement in degree of adjustment with age.

Treated by correlative analysis, the coefficient of relationship between age and neuroticism among the single group was $r$ equals $+.120 \pm .072$. The $r$ for the married group was $-.189 \pm .081$. The difference of these coefficients is $.309 \pm .108$. Thus it is seen that only by separating the married and single teachers do these rather significant relationship trends become apparent. Since these teachers were employed in schools where generally those single teachers who married might remain in teaching service, it could well be that the

trends shown before thirty-five years of age for both groups are somewhat due to the passing over into the married group of the better adjusted single teachers. However, causal interpretations are not to be attempted with this limited sample.

CHART I.

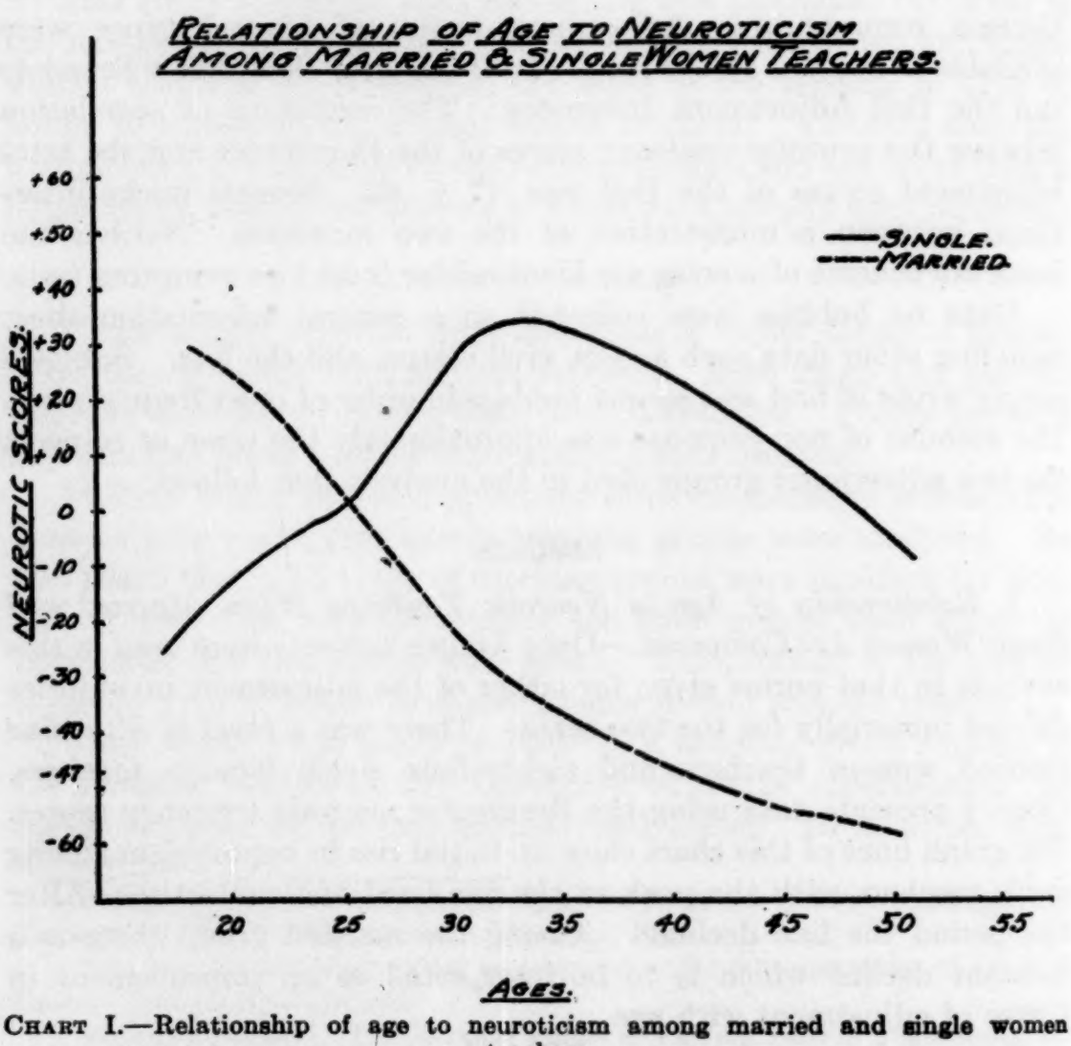


CHART I.—Relationship of age to neuroticism among married and single women teachers.

2. *Type of Hobby as Related to Degree of Neurotic Tendency.*—This analysis is made on the basis of two groups taken from extremes of the Bernreuter neurotic scores. The upper twenty per cent (poorly-adjusted) is considered an extremely neurotic group, since all scores are above the ninety percentile point of Bernreuter's norms. Scores of the lower twenty per cent (well-adjusted) group go as high as the

thirty-five percentile point and indicate good adjustment. There were thirty-four subjects in each group.

In the analyses of the data on hobbies it was found advisable to convert the raw data on hobbies into three classifications. The first, active-social, comprises such hobbies as active sports, hunting, fishing, camping, hiking and social dancing. The second, sedentary-solitary, includes primarily sedentary hobbies that may possibly be solitary or are usually solitary. The third group, work-type hobbies, includes responses of several subjects who listed teaching as first hobby. The third category also includes special subjects such as arithmetic and, in the cases of married women teachers, housework when listed as a hobby. First and second hobbies are each counted once; thus two tallies are possible for each subject.

TABLE I.—HOBBIES OF CRITERION ADJUSTMENT GROUPS

| Type of hobby | Total | Well-adjusted | Poorly-adjusted | Per cent poorly-adjusted |
|---|---|---|---|---|
| I. Active, outdoor, and social..... | 28 | 22 | 6 | 21.43 |
| II. Sedentary, vicarious, solitary... | 37 | 19 | 18 | |
| III. Work-type and teaching..... | 28 | 4 | 24 | 85.75 |

Two statistical analyses are based on the data in Table I. It is to be noted that approximately the same number from either criterion group of neuroticism listed hobbies falling in the sedentary-solitary category. Thus, for the two adjustment groups a difference of proportion computed for categories I and III is found to be $64.32 \pm 8.4$, the difference applying to either group in reciprocal order. There is a definite difference in favor of the well-adjusted group in amount of participation in active-social hobbies. Conversely, the difference is greater and unfavorable for the unadjusted group in the direction of preponderance of work-type hobbies. Using all three categories, the contingency coefficient is found to be .58. This index is corrected for the obviously broad category grouping. Such a relationship is substantially the same as indicated by the difference in proportion.

## IMPLICATIONS AND SUGGESTIONS FOR FURTHER STUDY

Two trends suggestive of further possibly fruitful study have thus been found:

(1) The relationship of age to adjustment differs if married and single teachers are considered separately. A reduction in degree of

neuroticism among single teachers appears after the peak years of the thirties have passed. Among married teachers, increases in age are accompanied by constant reduction of maladjustment scores.

(2) The hobbies of teachers seem to be somewhat symptomatic of the type of maladjustment characterizing the given teacher. That is, introvertive teachers appear to have introvertive hobbies while the extrovertive have extrovertive hobbies. It is usually recommended that hobbies be corrective, as for example, an introvertive person should find at least in his hobby or recreation some extrovertive activity. Thus teachers might well profit from reversing the trend which the present data indicate as respects teachers' hobbies.

While it is true the present data involve rather crude categories in thus classifying hobbies, it is possible that if hobbies and other activity-interests of teachers were properly scaled as to general degree of overtness, social participation, and the like, an even clearer trend would be revealed. Such a study based on well-selected samples of teachers in the field would be of great value. Further studies with large samples drawn from each age grouping and each type of marital status would be of definite value for further check on the data of the first section of this report. A check to determine to what extent eliminative factors may cause either the rise or fall in neuroticism scores is also needed.

# A COMPARISON OF THE THORNDIKE WORD LISTS

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Among the most important and influential vocabulary investigations is that of Thorndike, which resulted in the "list of ten thousand words."[1] This list presents in alphabetical order the ten thousand words which were found to occur most widely in about four and one-half million running words derived from forty-one sources which included children's literature, the Bible and English classics, elementary-school textbooks, daily newspapers, correspondence, and vocational books dealing with cooking, sewing, farming, and the trades.

During the decade following the publications of this word list, many vocabulary analyses were made in which the word list served as the criterion of appropriateness and difficulty of vocabulary, and as the basis for determining the content of various general and specific word lists. Typical studies of this sort are (to cite only a few), those by Lively and Pressey,[2] Powers,[3] Remmers and Grant,[4] and Barr and Gifford.[5]

The value of the Thorndike list and, consequently, to a considerable extent of all the studies based upon it, rests chiefly upon two assumptions, the validity of which has not been substantiated by investigational evidence: First, that there is a high negative correlation between the importance of a word as indicated by the frequency with which it appears in the literature sampled and its difficulty; and, second, that

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[1] Thorndike, E. L.: *The Teacher's Word Book.* New York: Bureau of Publications, Teachers College, Columbia University, 1921.

[2] Lively, Bertha A., and Pressey, S. L.: "A Method for Measuring the 'Vocabulary Burden' of Textbooks." *Educational Administration and Supervision*, Vol. IX, October, 1923, pp. 389–398.

[3] Powers, S. R.: "The Vocabulary of Scientific Terms for High-School Students." *Teachers College Record*, Vol. XXVIII, November, 1926, pp. 220–245.

[4] Remmers, H. H. and Grant, A.: "The Vocabulary Load of Certain Secondary-School Mathematics Textbooks." *Journal of Educational Research*, Vol. XVIII, October, 1928, pp. 203–210.

[5] Barr, A. S., and Gifford, C. W.: "The Vocabulary of American History." *Journal of Educational Research*, Vol. XX, September, 1929, pp. 103–121.

the sources from which the list of ten thousand words was obtained constitutes a representative sampling of literature. The discussion that follows deals entirely with the second assumption.

Ten years after the first list appeared, Thorndike published a "twenty-thousand-word list."[1] This was constructed on the basis of the original list supplemented by "extensive additional counts from over two hundred other sources including about five running million words, and extensive word counts made by the American Classical League and by Ernest Horn, and less extensive counts by Powers, Pressey, Curtis, and Keboch." The procedures used in constructing the list were essentially the same as those which were used in making the original one and are described in detail by the investigator.[2]

It would seem logical to assume that to the extent to which the twenty-thousand-word list is a revision as well as an extension of the earlier list, it is a more reliable vocabulary list than the "ten thousand words," since it is derived from so much more extensive and widely distributed samplings of literature; and that the second list must necessarily differ more or less extensively from the first, unless the first one should happen to have been based upon a sufficiently wide and diverse sampling of literature that subsequent extensions of these sources and materials would fail to produce changes in it.

The question, therefore, arises: "To what extent is the first half of the twenty-thousand-word list different from the preceding ten-thousand-word list, and, therefore, to what extent do the results of the numerous vocabulary studies based upon the original list differ from those which would have been obtained had the analysis been made on the basis of the later list?" It is interesting to note that some investigators apparently assumed that the twenty-thousand-word list is to a greater degree an extension rather than a revision of the original one, since they published subsequent to the appearance of the twenty-thousand-list, studies based on the ten-thousand word list,[3,4] It is, of

[1] Thorndike, E. L.: *A Teacher's Word Book of Twenty Thousand Words Found Most Frequently and Widely in General Reading for Children and Young People.* New York: Bureau of Publications, Teachers College, Columbia University, 1931.

[2] *Ibid.*, Appendixes A and B.

[3] Pressey, Luella Cole: "Fundamental Vocabulary in Elementary-School Geography." *The Journal of Geography*, Vol. XXXII, February, 1933, pp. 78–81.

[4] Driggs, H. Wayne: "The Vocabulary of Letters of Boys and Girls Twelve to Fifteen Years of Age Inclusive," *Journal of Experimental Education*, Vol. II, June, 1934, pp. 339–354.

course, possible that these investigations had been completed before the revised Thorndike list became available.

## STATEMENT OF THE PROBLEM

The purpose of the investigation here reported is to make a detailed comparison of the two Thorndike lists, the ten-thousand-word list and the twenty-thousand-word list. This major problem includes these minor problems: (1) To what extent do the words found in the first five thousand-word levels of the first list fail to appear in the corresponding thousand-word levels of the later list? (2) To what extent do words appearing in the original list of ten thousand words appear in thousand-word levels above the tenth in the later list? and (3) To what extent are words occurring in the first ten thousand-word levels of the twenty-thousand-word list not found in the original list?

## METHOD

In solving the first minor problem, every word of the first five thousand of the original Thorndike list was located in the twenty-thousand-word list. In every case in which a word occurred in a different thousand-word level in the second list from the one in which it appeared in the first, a notation was made of the direction and the extent of the shift. It would have been desirable to extend this comparison to include all the words in the entire ten-thousand-word list, but this could not be done, because the thousand-word levels of the words in the second half of the earlier Thorndike list are not given, and, therefore, it is not possible to determine these levels accurately from the credit numbers which are given.

The results of this first comparison are summarized in Table I.

It will be noted in Table I that two hundred twenty-six words or 4.52 per cent of the words of the first five thousand in the ten-thousand-word list are found in different thousand-word levels in the second word list. Almost all these shifts are from one thousand-word level to the one next above or below it. It is especially interesting to note that one hundred fifty-nine or about one in every six of the words which appear in the fifth thousand-word level of the original list are found in other thousand-word levels in the revised list. This fact may indicate more numerous and extensive shifts in positions of words in the upper half of the ten-thousand-word list to other thousand-word levels in the twenty-thousand word list.

The data of Table I are further summarized in Table II.

It is evident from Table II that two hundred fifteen, or approximately ninety-five per cent, of the two hundred twenty-six displaced words of the first five thousand-word levels of the original list found places in higher levels, and that eleven or approximately five per cent

TABLE I.—NUMBERS OF WORDS IN THE FIRST FIVE THOUSAND-WORD LEVELS OF THE THORNDIKE TEN-THOUSAND-WORD LIST WHICH WERE SHIFTED TO OTHER THOUSAND-WORD LEVELS IN THE THORNDIKE TWENTY-THOUSAND-WORD LIST; THE EXTENT AND DIRECTION OF THESE SHIFTS

| Extent and direction of shift in thousand-word level | Number of words | Per cent of five thousand words | Per cent of words within the thousand |
|---|---|---|---|
| First to second[1] | 9 | .18 | .9 |
| Second to third | 11 | .22 | 1.1 |
| Second to ninth | 1 | .02 | .1 |
| Third to second | 1 | .02 | .1 |
| Third to fourth | 43 | .86 | 4.3 |
| Fourth to third | 1 | .02 | .1 |
| Fourth to twentieth | 1 | .02 | .1 |
| Fifth to fourth | 9 | .18 | .9 |
| Fifth to sixth | 148 | 2.96 | 14.8 |
| Fifth to tenth | 1 | .02 | .1 |
| Fifth to twentieth | 1 | .02 | .1 |
| Total | 226 | 4.52 | |

[1] Table I is read thus: Nine words which are in the first thousand-word level of Thorndike's ten-thousand-word list appear in the second thousand-word level of Thorndike's twenty-thousand-word list. These nine words constitute .18 per cent of the total five thousand words compared; also, they constitute .9 per cent of the words in the first thousand-word level of the ten-thousand-word list.

of the displaced words found places in lower levels in the later list. This fact indicates that two hundred fifteen words were encountered with greater relative frequency, and that eleven appeared with smaller relative frequency in the forty-one original sources than in the more than two hundred additional sources used in constructing the second list.

The next phase of the investigation is concerned with the words of the ten-thousand-word list which are found in thousand-word levels above the tenth in the twenty-thousand-word list. Table III present a summary of these data.

TABLE II.—EXTENT AND DIRECTION OF SHIFTS OF WORDS FROM CERTAIN THOUSAND-WORD LEVELS OF THE THORNDIKE TEN-THOUSAND-WORD LIST TO OTHER THOUSAND-WORD LEVELS OF THE THORNDIKE TWENTY-THOUSAND-WORD LIST

| Number of words | Direction of shift | Number of thousand-word levels | Per cent of five thousand words |
|---|---|---|---|
| 211[1] | Upward | 1 | 4.22 |
| 1 | Upward | 5 | .02 |
| 1 | Upward | 7 | .02 |
| 1 | Upward | 15 | .02 |
| 1 | Upward | 16 | .02 |
| 11 | Downward | 1 | .22 |
| 226 | | | 4.52 |

[1] Table II is read thus: two hundred eleven words, or 4.22 per cent, of the words of the first five thousand-word levels of Thorndike's ten-thousand-word list were each placed one thousand-word level higher in Thorndike's twenty-thousand-word list.

TABLE III.—NUMBERS OF WORDS IN THORNDIKE'S TEN-THOUSAND-WORD LIST WHICH APPEARED IN VARIOUS THOUSAND-WORD LEVELS ABOVE THE TENTH IN THE THORNDIKE TWENTY-THOUSAND-WORD LIST

| Thousand-word level | Number of words | Per cent of ten thousand words | Per cent of words within the thousand |
|---|---|---|---|
| Eleventh[1] | 439 | 4.39 | 43.9 |
| Twelfth | 343 | 3.43 | 34.3 |
| Thirteenth | 261 | 2.61 | 26.1 |
| Fourteenth | 110 | 1.10 | 11.0 |
| Fifteenth | 15 | .15 | 1.5 |
| Sixteenth | 26 | .26 | 2.6 |
| Seventeenth | 16 | .16 | 1.6 |
| Eighteenth | 3 | .03 | .3 |
| Nineteenth | 2 | .02 | .2 |
| Twentieth | 2 | .02 | .2 |
| Above the twentieth | 2 | .02 | .2 |
| Total | 1219 | 12.19 | |

[1] Table III is read thus: four hundred thirty-nine words which appear in the Thorndike ten-thousand-word list are found in the eleventh thousand-word level of the Thorndike twenty-thousand-word list. These four hundred thirty-nine words constitute 4.39 per cent of the words in the earlier list.

It is evident from Table III that one thousand two hundred nineteen, or 12.19 per cent of the words of the Thorndike ten-thousand-word list are not among the first ten-thousand words of the twenty-thousand-word list. It will be noted further that words from the original list occupy 43.9 per cent (more than two-fifths) of the places in the eleventh thousand-word level of the later list; and, respectively, 34.3, 26.1, and 11.0 per cent of the positions in the twelfth, thirteenth, and fourteenth thousand-word levels of the twenty-thousand word list. Thus, one thousand one hundred fifty-three, or approximately 28.8 per cent of all the words in the first four thousand-word levels above the tenth in the later list are words of the original ten-thousand-word list.

The final phase of the investigation is concerned with determining the words which occur among the first ten thousand words in the twenty-thousand-word list but which do not occur among the ten thousand words of the first list. This step provides a check on the results of the preceding one. Table IV summarizes the data.

TABLE IV.—NUMBERS OF WORDS IN THE FIRST TEN THOUSAND-WORD LEVELS OF THE THORNDIKE TWENTY-THOUSAND-WORD LIST WHICH ARE NOT FOUND IN THE THORNDIKE TEN-THOUSAND-WORD LIST

| Thousand-word level | Number of words | Per cent of ten thousand words | Per cent of words within the thousand |
|---|---|---|---|
| First | 0 | .00 | .00 |
| Second | 1 | .01 | .1 |
| Third | 4 | .04 | .4 |
| Fourth | 6 | .06 | .6 |
| Fifth | 8 | .08 | .8 |
| Sixth | 24 | .24 | 2.4 |
| Seventh | 134 | 1.34 | 13.4 |
| Eighth | 279 | 2.79 | 27.9 |
| Ninth | 332 | 3.32 | 33.2 |
| Tenth | 422 | 4.22 | 42.2 |
| Total | 1210 | 12.10 | |

Table IV reveals the fact that one thousand two hundred ten, or 12.10 per cent, of the words in the first half of the twenty-thousand word list, and that one thousand one hundred sixty-seven, or approximately 29.2 per cent (nearly one-third), of all the words of the seventh, eighth, ninth, and tenth thousand-word levels of the twenty-thousand-

word list, do not appear in the original ten-thousand-word list. Also, as would be expected from the data presented in Table III, Table IV shows that the numbers and percentages of words of the seventh, eighth, ninth, and tenth thousand-word levels of the twenty-thousand word list which have displaced words of the original list increase as the levels advance.

An apparent discrepancy will be noted between the data in Table III and those in Table IV. Table III shows that one thousand two hundred nineteen words included in the ten-thousand-word list are not among the first ten-thousand words of the twenty-thousand-word list; Table IV, however, indicates that only one thousand two hundred ten words in the first half of the twenty-thousand-word list have displaced words in the original ten-thousand-word list. The explanation is that although there are exactly ten thousand words in the first ten-thousand-word levels of the twenty-thousand-word list, there are actually ten thousand eleven words in the original ten-thousand-word list. Thus, although one thousand two hundred nineteen words of the ten-thousand-word list do not have positions among the first ten thousand-word levels of the twenty-thousand word list, the number of words in the first half of the twenty-thousand word list which would be needed to replace the one thousand two hundred nineteen words may range from one thousand two hundred ten to one thousand two hundred nineteen, depending on how many of the eleven extra words in the ten-thousand word list are among the one thousand two hundred nineteen words displaced from that list. If none of the eleven extra words were among the one thousand two hundred nineteen crowded out of the first word list, then one thousand two hundred eight words from the second half of the twenty-thousand-word list would, with the eleven extra words, replace the one thousand two hundred nineteen words; if, however, all the eleven words in excess of the ten thousand were among the one thousand two hundred nineteen words displaced from the original word list, then one thousand two hundred nineteen words from the second half of the twenty-thousand word list would be needed to make the total of exactly ten thousand words. Since Table IV reveals that there are one thousand two hundred ten words replacing the one thousand two hundred nineteen among the ten thousand-words of the original list, it may be concluded that two of the extra eleven words of the original list have positions above the tenth thousand-word level in the twenty-thousand-word list.

## CONCLUSIONS

In the light of the data presented, these conclusions seem justified: The twenty-thousand-word list is not merely an extension of the ten-thousand word list; the first half of the later list constitutes a substantial revision of the earlier one. Results of vocabulary analyses based upon the original Thorndike list would, therefore, differ markedly from the results obtained from analyses of the same material based upon the first ten thousand words of the second Thorndike list. There would be a close agreement in the results with the two lists only if the investigation were confined within the first six thousand words as a unit; even then, if the analysis involved allocation of words to exact thousand-word levels, there would be a considerable disagreement in the results obtained with the two lists. Analyses of words on the basis of the seventh, eighth, ninth, and tenth thousand-word levels of the original list would differ so widely from similar analyses of the same material on the basis of the corresponding thousand-word levels of the twenty-thousand-word list that valid comparisons of these analyses would be impossible.

If, then, the placement of the words in the twenty-thousand-word list is more reliable than that of the words in the original list—an assumption which could scarcely be questioned—then the results of the numerous studies which were based on the original list, especially those studies in which a word was considered to be a "difficult" or a "technical" one if it did not appear in the original ten-thousand-word list, are seriously to be questioned.

# THE ACQUISITION AND RETENTION OF READING SKILLS BY COLLEGE FRESHMEN

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It is a matter of surprise that the remedial treatment of slow reading is effective even at the adult level, a time when one would expect the mechanisms involved to be relatively unalterable. Successful experiments at Smith College,[1] at Ohio State University,[2] and at Dartmouth College,[3] to mention a few instances, seem to verify the expectation that the reading speed of college students may be improved to the extent of one hundred per cent in many cases.

However, it must be remembered that there is the utmost uncertainty regarding the essential causes of reading disability; and many assumed causes, such as slow and uncoördinate eye-movements, poor visual and auditory acuity, eye-muscle imbalance and various refractive errors of vision, narrow visual and apprehension spans, have not been established as sufficient causes in the majority of cases despite the most careful tests made with regard to them. The references to this literature are too extensive to be cited here, except for the mention of the recent Dartmouth study.[4] This investigation, made with the best facilities, agrees with the majority of previous studies in finding no essential relationship between visual factors and reading skills.

## THE REMEDIAL READING EXPERIMENTS AT WELLS COLLEGE

Two successful preliminary experiments at Wells College in 1936 prompted a more extensive experiment in the Fall of 1937. The more important details of the 1937 experiment were as follows: Ninety-nine freshmen were given the ACE Intelligence Examination, several tests of personality trends, and the Iowa Advanced Silent Reading Test, Form *A*. We had found in the previous year's experiments

[1] Blake, M. B. and Dearborn, W. F.: "The Improvement of Reading Habits." *Jour. Higher Educ.*, Vol. VI, 1935, pp. 83–88.

[2] Lauer, A. R.: "An Experimental Study of the Improvement of Reading by College Students." *Jour. Edu. Psych.*, Vol. XXVII, 1936, pp. 655–662.

[3] Bear, R. M.: "Disabled Readers at Dartmouth College." *Bulletin of the Am. Assoc. of Collegiate Registrars*, January, 1937, pp. 138–144.

[4] Imus, H. A., Rothney, J. W. M., and Bear, R. M.: "An Evaluation of Visual Factors in Reading." *Dartmouth College Publications*, Hanover, 1938.

that after a period of training subjects read Form *B* of the Iowa Test with such facility that the standard time intervals prescribed on the sub-tests were too long, except for test 6, the speed test. Accordingly we adopted shorter time intervals for all tests except the sixth. Form *A* was given in such a way that we secured both full-time and short-time scores. The full-time or standard scores indicated that our freshman class contained some students with low levels of reading ability, resembling in this respect the reports from Chicago, Miami, Smith, Dartmouth, and other colleges. Four of our freshmen ranked below the ninth-grade (high-school) level in reading speed, thirteen ranked at the ninth-grade level, while ten ranked at the tenth-grade level. Perhaps, as Dearborn alleges, the reading speed standards of this test are too high. As regards comprehension scores, the evidences of retardation are less serious, ten subjects falling within the eleventh- and twelfth-grade levels, all other cases falling within college standards.

We tested the reliability of our arbitrary limitation of the standard testing time by means of appropriate correlations. The $r$ between full-time and short-time comprehension scores was $+.914$ ($\pm.011$). For full-time and short-time speed scores the $r$ was $+.819$ ($\pm.022$). Apparently, shortening the testing time intervals by almost one-half does not materially reduce reliability. However, in the final studies of our results, to be reported below, we used the short-time comprehension scores and full-time speed scores.

We selected forty-four freshmen showing comprehension and speed percentiles of thirty percentile or less to serve as experimentals, the remaining members of the freshman class to serve as controls. We were careful to see to it that there were at least twenty-five students among the controls who were equal to twenty-five experimentals as regards initial tests of intelligence, reading speed, and reading comprehension. The forty-four experimentals were again divided into two groups of subjects equated for intelligence and reading scores. The ACE Intelligence Test gives an $r$ of $+.732$ ($\pm.018$) with reading comprehension, and an $r$ of $+.405$ ($\pm.034$) with reading speed. This suggests that tests of reading comprehension are essentially intelligence tests; and our subsequent failure to improve reading comprehension to a considerable extent is a consequence of the fact that intelligence level is not subject to large changes.

One group of twenty-one experimentals reported once each week for a thirty- to forty-five-minute period of tachistoscopic exercises,

continued for six successive weeks. We had prepared some six hundred cards which by insertion into the carrier of a reflectoscope, in relay with a small tachistoscope, could be "flashed" on a daylight screen for intervals of one-twentieth to one full second. The materials on the cards were quite varied, beginning with various "nonsense" forms and words (designed to enforce reliance on visual rather than auditory memory cues), and ending finally with complex sentences.

Another group of twenty-three experimentals reported for similar periods once each week for six weeks during which they worked under supervision with the exercises of L. C. Pressey's *Manual of Reading Exercises for Freshmen.*[1] At the end of the six weeks of training, all experimentals and all controls were given Form *B* of the Iowa Test, using again our short-time intervals for the comprehension sub-tests.

## RESULTS OF THE EXPERIMENT

It is usually found that subjects with the lowest initial reading scores will make larger gains through practices; and this was generally the case in our experiment. The correlation between initial comprehension and comprehension gain was $-.203$ ($\pm.098$), and the $r$ between initial speed and speed gain was $-.439$ ($\pm.082$). Initial intelligence scores, however, have little relationship to gain.

Table I gives the comparative gains of all controls and all experimentals. The controls show gains in both comprehension and speed,

TABLE I.—GAINS OF ALL CONTROLS AND ALL EXPERIMENTALS

(*A*) Controls, Fifty-one Cases

| Factor tested | Initial score | Final score | Gain in percentages | Residual gain |
|---|---|---|---|---|
| Comprehension | 136.7 | 142.3 | 4.5 | |
| Speed | 38.9 | 42.9 | 10.3 | |
| Intelligence | 238.0 | | | |
| (*B*) Experimentals, Forty-four cases | | | | |
| Comprehension | 105.8 | 122.0 | 15.3 | +10.8 |
| Speed | 28.2 | 37.9 | 34.1 | +23.8 |

but the experimentals made larger gains, their residual gain over the controls being about eleven per cent for comprehension and about

[1] Ohio State University Press, 1936.

twenty-four per cent for speed. It will be noted that the controls are considerably above the experimentals on initial scores. Our experimentals should make greater gains because their initial reading scores are lower. In order to rule out this factor we selected twenty-five experimentals and twenty-five controls whose initial scores on intelligence, speed, and comprehension are much more alike. The results are given in Table II.

TABLE II.—GAINS OF EQUATED CONTROLS AND EXPERIMENTALS

| Factor tested | Initial score | Final score | Gain in percentages | Residual gain |
|---|---|---|---|---|
| **(*A*) Controls, Twenty-five Cases** | | | | |
| Comprehension | 121.0 | 129.8 | 7.3 | |
| Speed | 33.9 | 38.2 | 15.6 | |
| Intelligence | 213.0 | | | |
| **(*B*) Experimentals, Twenty-five Cases** | | | | |
| Comprehension | 116.3 | 130.4 | 12.1 | + 4.8 |
| Speed | 31.0 | 42.2 | 36.1 | +20.5 |
| Intelligence | 217.0 | | | |

It will be seen that the residual superiority of experimentals is now somewhat less than shown in Table I, but still amounts to about five per cent for comprehension and to about twenty-one per cent for speed. These improvements are not large, but are rather remarkable in view of the fact that they were achieved in no more than six brief periods of remedial work for each subject. We tested the reliability of the differences between controls and experimentals by means of critical ratios, finding that the final score difference as regards comprehension (after equating the groups for initial score) divided by the standard error of the difference gives a ratio of 1.85. The same computation made for final speed differences, however, gives a reliable ratio of 3.604.

Individual gains of members of the experimental group were highly variable. As regards speed improvements, for instance, three subjects made gains of over eighty per cent, while three other subjects actually showed small losses. Two of the cases showing losses were reported as quite uncoöperative throughout the experiment, and the third case was irregular and frequently late in attendance, complaining about a heavy burden of regular college work.

We had divided the forty-four experimentals into two equated groups with a view of determining the respective merits of the tachistoscopic and the Pressey Manual methods of training. Sharing the current distrust of flash card methods, we yet expected that this method should improve speed rather than comprehension, while the Pressey Manual was expected to develop comprehension with relatively greater success. An examination of the results, however, shows no essential difference between the two methods. It appears that both methods result in speed improvements, and that the comprehension gains are due to more careful reading made possible by the speed gains. Herein lies the great advantage of speed, not merely in reading, but in other tasks as well. Quality of achievement in general must be contingent upon the amount of time available for achieving it.

Our periods of remedial work were additional to regular scheduled courses and by unfortunate necessity had to come at the unfavorable hours of 4.30 to 5.30 of the day. The experimentals were eventually asked to express their judgments regarding the burdensomeness of the additional appointments. Sixteen subjects reported the reading periods as "not burdensome" additions to regular work, twenty-eight reported them as "moderately burdensome," while one subject found this work "very burdensome." Examination of the findings shows that these attitudes have little effect on the quality of the improvements shown except for the one case who found the exercises very burdensome.

We had given the experimentals Guilford's questionnaire test designed to measure tendencies towards social introversion, emotionality, and masculinity, and also Allport's AS Reaction Study. None of the scores of these tests taken singly show any significant relationship either to initial scores or to rates of improvement. However, if we select the subjects who combine marked tendencies towards ascendancy but who are at the same time of a phlegmatic and cool emotional make-up (low emotionality score on Guilford's test) and compare them with highly emotional subjects but with relatively weak self-assertion, we find a marked advantage in favor of the former. The group of ascendant-unemotional subjects show an average improvement of eighteen per cent in comprehension and an average improvement of thirty-nine per cent in speed; as opposed to a gain of but fourteen per cent in comprehension and twenty-three per cent in speed made by the highly emotional and non-aggressive subjects.

### RETENTION OF IMPROVEMENTS IN READING

The belief that remedial reading work does improve reading skills is practically unanimous among psychologists. However, the practical worth of remedial work hinges on the answer to the question: "How permament is the retention of acquired reading skill?" This question has been neglected in most studies; but in the few that give it consideration, it appears that high degrees of retention are to be expected. R. W. Deal[1] reports experiments with groups of college students drilled in reading and study habits for periods of one semester. This procedure resulted in an improvement of comprehension scores, raising them from an initial average of thirty-three to a final average of sixty-seven. The controls, meanwhile, showed no improvements. In the case of one group of ninety-one members, forty-two subjects were retested after the lapse of a year, with the showing that the previous final average score of sixty-seven had dropped to about sixty-four.[2] Deal concludes that the gains made are substantially retained.

In the recently reported Dartmouth[3] study, a total of one hundred ninety-four students had received varied remedial instruction: Speeded reading exercises, Metron-O-Scope exercises, vocabulary improvement, and other aids. The periods of training varied from about one month for some subjects to about two months for others. The authors retested all groups six months after the initial test, and secured reliable evidences of gains for both comprehension and speed as measured by the Iowa test. One year later, eighty-eight of the freshmen experimentals were tested again with Form *B* of the Iowa test, with the result that ninety-five per cent of the subjects were still superior to their initial test scores for both comprehension and rate. More significant is the fact that these final scores are usually higher than the retest scores given after the remedial training of the year previous.

The evidence offered by the two studies cited above to support the belief that remedial reading work has lasting effects is made somewhat uncertain by the fact that controls were not retested after the lapse of a year. One would expect the controls to make decided improvements due to the effects of a year of college training. In September, 1938, we

[1] Deal, R. W.: "The Development of Reading and Study Habits in College Students." *Jour. Edu. Psych.*, Vol. xxv, 1934, pp. 258–273.

[2] Estimated by reading Deal's graph No. 8, *op. cit.*, p. 268.

[3] Imus, Rothney, and Bear: *Op. cit.*, pp. 109–111.

gave Form *A* of the Iowa test to the previous year's freshmen. This included thirty-one of the forty-four original experimentals and forty-two of the original group of fifty-one controls. Table III gives the results bearing on the question of retention after the lapse of about thirteen months since the initial test of 1937 and of eleven months since the retest of 1937.

TABLE III.—RETENTION STUDY OF READING SKILLS

| Initial 1937 scores | | | | | 1938 percentages of gain over | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | 1937 retest | | 1937 initial test | |
| Groups | *N* | ACE | Comprehension | Speed | Comprehension | Speed | Comprehension | Speed |
| Controls..... | 42 | 247.3 | 139.5 | 39.2 | 13.7 | 7.4 | 18.1 | 18.1 |
| Pressey..... | 17 | 195.1 | 105.4 | 27.4 | 11.7 | −2.6 | 27.7 | 33.2 |
| Flash-card..... | 14 | 202.9 | 110.9 | 31.2 | 15.0 | 1.3 | 29.0 | 26.9 |

It will be seen that the equivalence of groups in initial scores no longer holds, due to the failure to retest all cases in 1938. The 1938 control group is superior to the experimentals in ACE Intelligence, reading comprehension, and reading speed. The last four columns to the right in Table III give the data bearing on the question of retention of gain. The first two of these show that the controls have improved the most since the 1937 retest. These improvements will be due in part to the fact that they had Form *A* of the Iowa test thirteen months earlier, and in part to a year of college training. The Pressey Manual experimentals show an actual loss of 2.6 per cent in speed over the 1937 retest. The flash-card experimentals show an improvement in comprehension slightly greater than the corresponding improvement shown by controls. The last two columns show that both groups of experimentals are more superior to their initial status in 1937 than are the controls.

It is hardly to be expected that increased facility in reading acquired in so short a period as six weeks should persist without loss. The skills acquired are in a true sense a form of "over-training," perhaps somewhat artificial. This defect is not unique for the acquisition of reading skills: All motor and mental skills acquired by intensive training are subject to such "lapses." The improvement of 1938 over 1937 are due to regular college work in two ways: First, college work *as such*

would be expected to develop such skills; and, secondly, college work has the effect of consolidating the gains due to remedial reading. We had given each experimental subject a set of simple rules to observe in daily reading, designed to convert the new habits acquired during the reading exercises into permanent habits. Had our remedial work been given during a vacation period, this assimilative rôle of regular college work would have been lacking, and, under those circumstances, it is doubtful whether the exercises would have had beneficial effects to the extent actually found.

## SUMMARY

Remedial reading exercises were given to forty-four college freshmen showing scores in the thirty percentile or less on the Iowa Advanced Reading Test, Form *A*. Two equated groups of experimentals were formed, one group taking the exercises of the Pressey Manual of reading exercises for freshmen, the other group taking tachistoscopic reading exercises. Both groups received six periods of remedial training distributed over six weeks. The resulting gains of experimentals are compared with scores of control groups immediately after the period of remedial work, and again one year later. The chief results were as follows:

(1) Immediately after the remedial work, both groups of experimentals show residual gains over the control subjects, both for speed and comprehension.

(2) The reading exercises result in greater increments of reading speed than of comprehension scores.

(3) The remedial methods used, the Pressey Manual and the Tachistoscopic exercises, yielded approximately equal improvements in reading skills.

(4) The improvements of the experimentals are not materially affected by the fact that the remedial work was found a burdensome addition to regular college work.

(5) Personality trait scores, taken singly, have no apparent relation to initial reading scores and rates of improvement. However, traits of low emotionality and high ascendancy when combined in the same subjects lead to larger improvements due to remedial reading.

(6) Retests of controls and experimentals after the lapse of a year indicate that the gains made due to remedial reading are substantially retained for the period of a year.

# SCHOLASTIC CHARACTERISTICS OF STUDENTS TAKING ADVANCED COURSES IN PSYCHOLOGY[1]

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An attempt is made in this study to determine the scholastic characteristics of students in advanced courses in psychology at the University of Michigan and to discover any differences that might exist between those whose preliminary training in the subject did and did not include laboratory work.

During the year 1936–1937 there was an undergraduate enrollment in advanced courses in psychology of three hundred forty-three persons whose elementary work had been done in the same institution. All but fifteen of these had taken this work during their sophomore year in the University.

The academic characteristics included in this survey are: Intelligence (indicated by the percentile ranking on the American Council Psychological Examination), the grade obtained in the introductory course in psychology, the average grade obtained in advanced courses in psychology, the number of hours of advanced work in the subject, and the total scholastic average in the University of Michigan.

Table I gives information concerning these five variables for three groups of undergraduate students taking advanced courses in psychology.

TABLE I.—SCHOLASTIC CHARACTERISTICS OF STUDENTS TAKING ADVANCED COURSES IN PSYCHOLOGY

| | Sophomores | Juniors | Seniors |
|---|---|---|---|
| Intelligence | 56.11 | 51.22 | 48.18 |
| Grade in elementary course | 2.43 | 2.43 | 1.94 |
| Scholastic average | 2.21 | 2.36 | 2.03 |
| Average grade in advanced work | 2.37 | 2.49 | 1.79 |
| Number of hours of advanced work | 2.94 | 3.84 | 5.88 |
| Number of cases | 188 | 138 | 17 |

Apparently, the sophomores taking advanced courses constituted a slightly more intelligent group than did the juniors and seniors.

[1] This study was made in the Office of Educational Investigations of the University of Michigan during the author's leave of absence from the University of Kentucky.

If this situation were found to exist from year to year, it would indicate that the proportion of students in the higher percentiles in intelligence taking advanced work in psychology becomes smaller as they progress in their academic careers. It might be well to check this possibility on larger groups and at other institutions.

TABLE II.—COEFFICIENTS OF CORRELATION OF INTELLIGENCE WITH OTHER FACTORS

| | All | Sophomores | Juniors | Seniors |
|---|---|---|---|---|
| Intelligence with: | | | | |
| Grade in elementary course | .49 | .32 | .57 | .50 |
| Scholastic average | .57 | .61 | .51 | .47 |
| Average grade in advanced work | .25 | .24 | .33 | −.58 |
| Number of hours of advanced work | .13 | .28 | .10 | .10 |

The average grades in elementary psychology were the same for sophomores and juniors, but that of the seniors was considerably lower. While the total scholastic average of the juniors exceeded that of the sophomores, that of the seniors was well below either.

TABLE III.—COEFFICIENTS OF CORRELATION OF GRADE IN ELEMENTARY PSYCHOLOGY WITH OTHER FACTORS

| | All | Sophomores | Juniors | Seniors |
|---|---|---|---|---|
| Grade in elementary psychology with: | | | | |
| Intelligence | .49 | .32 | .57 | .50 |
| Scholastic average | .84 | .83 | .79 | .56 |
| Average grade in advanced work | .71 | .68 | .77 | −.47 |
| Number of hours of advanced work | .41 | .49 | .46 | .13 |

The same situation was found with regard to average grades in advanced courses, but was even more pronounced in this case. Obviously, the average number of hours of advanced work increased as the students progressed from one classification to the next.

In order to investigate these relationships further, coefficients of correlation were computed from the original data with the results shown in Table II.

For the group as a whole and for sophomores, intelligence predicted total scholastic averages better than it did any of the other character-

istics, while for juniors and seniors it offered a slightly better prediction of grades in elementary psychology than of total standings. Its predictive value for the quality and quantity of advanced work was only slight, though in one case strongly negative.

For each individual group and for the group as a whole, grades in introductory work predicted general scholastic averages better than any other characteristic considered here. The predictive value of grades in beginning work for grades in advanced courses was high with the exception of those of the senior group. The negative correlation found in this case compares to a similar negative correlation of intelligence with grades in advanced work.

TABLE IV.—COEFFICIENTS OF CORRELATION OF SCHOLASTIC AVERAGE WITH OTHER FACTORS

| | All | Sophomores | Juniors | Seniors |
|---|---|---|---|---|
| Scholastic average with: | | | | |
| Intelligence | .57 | .61 | .51 | .47 |
| Grade in elementary course | .84 | .83 | .79 | .56 |
| Average grade in advanced work | .43 | .47 | .32 | −.03 |
| Number of hours of advanced work | .24 | .22 | .18 | −.11 |

The relation between general scholastic average and grades in introductory work was closer than any of the others in the above table, while that between scholastic average and number of hours of advanced work was very slight. Again, negative correlations were found between this measure and the quality and quantity of advanced work of senior students, consistent with the findings of the above paragraphs.

TABLE V.—THE RELATIONSHIP OF GRADES IN ADVANCED COURSES TO OTHER FACTORS

| Average grade in advanced courses | *N* | Intelligence percentile | Grade in elementary course | General scholastic average |
|---|---|---|---|---|
| 4.00 | 34 | 62.00 | 3.18 | 2.85 |
| 3.99–3.00 | 97 | 59.34 | 2.66 | 2.44 |
| 2.99–2.00 | 171 | 48.58 | 2.21 | 2.11 |
| 1.99–1.00 | 39 | 55.36 | 1.97 | 1.99 |
| 0.99–0.00 | 2 | 53.00 | 4.00 | 3.50 |

The intelligence percentiles, grades in elementary work, and general scholastic averages of students in the first three groups (making at least a *C*-average in advanced courses) decreased consistently with a decreasing average grade in advanced work, but for those making between *C* and *D* in advanced courses the intelligence percentile was higher. The group making between *D* and *E* (two cases) consisted of superior students, as judged by their grades in elementary psychology (*A*-average) and their general scholastic average (between *A* and *B*), while their intelligence was slightly above the median (53rd percentile).

TABLE VI.—COEFFICIENTS OF CORRELATION OF AVERAGE GRADE IN ADVANCED COURSES WITH OTHER FACTORS

| | All | Sophomores | Juniors | Seniors |
|---|---|---|---|---|
| Average grade in advanced courses with: | | | | |
| Intelligence | .25 | .24 | .33 | −.58 |
| Grade in introductory work | .71 | .68 | .77 | −.47 |
| Scholastic average | .43 | .47 | .32 | −.03 |
| Number of hours of advanced work | .32 | .37 | .55 | .31 |

As indicated above, these grades were predicted best by the grades in elementary psychology, except in the case of seniors, while intelligence and general scholastic average afforded a fair prediction, again with the exception of the seniors. The relationship between quantity and quality of advanced work was fair for all groups and highest for the juniors.

The general conclusions to be drawn from the above information are

(1) The quality and quantity of advanced work in psychology are predicted best by the grade in the introductory course in that subject, but the former association appears to be considerably closer than the latter.

(2) The grade in introductory psychology offers the best prediction of general scholastic average, and one which is superior to its prediction of quality and quantity of advanced work.

(3) Intelligence predicts general scholastic average better than any other factor here considered.

(4) There is a fair degree of association between quantity and quality of advanced work in psychology.

As a corrolary to the above findings, two groups of paired associates were studied in detail in which intelligence, grade in introductory psychology, scholastic averages in freshman and sophomore years, and status in the University of Michigan as of June, 1937, were kept constant. Among the three hundred forty-three students only thirty-one had taken laboratory work in connection with their elementary course in psychology, so that it was possible to select in each case individuals from the larger group who resembled them closely item-for-item.

The characteristics of the two groups become clear from Table VII.

TABLE VII.—CHARACTERISTICS OF TWO GROUPS OF PAIRED ASSOCIATES

| | Laboratory | Non-laboratory |
|---|---|---|
| Intelligence percentile | 58.57 | 58.19 |
| Number of hours of advanced work | 5.00 | 3.68 |
| Credit points per hour of advanced work | 2.75 | 2.67 |

It appears from this table that the quantity and quality of advanced work taken by laboratory students were superior to those of the non-laboratory group. This is hardly surprising in view of the fact that laboratory work is required of students majoring in psychology.

The coefficients of correlation for the various characteristics of these two matched groups, computed from the original data, are shown in Table VIII.

TABLE VIII.—COEFFICIENTS OF CORRELATION OF VARIOUS CHARACTERISTICS OF TWO MATCHED GROUPS

| | Grade in introductory course | | Grades in advanced work | | Number of hours of advanced work | |
|---|---|---|---|---|---|---|
| | Laboratory | Non-laboratory | Laboratory | Non-laboratory | Laboratory | Non-laboratory |
| Intelligence | .62 | .71 | .46 | .21 | .12 | −.05 |
| Grade in introductory course | ... | ... | .68 | .44 | .62 | .63 |
| Grades in advanced work | ... | ... | ... | ... | .62 | −.13 |

In both groups of students a close relationship existed between intelligence and grades in elementary courses in psychology and between grades in introductory work and number of hours of advanced work. The laboratory group showed a close correlation between grades in introductory work and quantity and quality of advanced work and between the grades in and number of hours of advanced work. There was a slight negative correlation in the latter respect for the non-laboratory group.

The conclusions to be drawn from this study of paired groups are

(1) For the laboratory students, grades obtained in introductory work offered the best prediction of the quality and quantity of advanced work.

(2) For both groups, intelligence predicted grades in elementary courses satisfactorily.

(3) Quality and quantity of advanced work were satisfactorily correlated for the laboratory students; slightly negatively for the others.

(4) With the exception of that between intelligence and number of hours of advanced work, all coefficients of correlation computed for the laboratory group were satisfactory, ranging from .41 to .68.

# COMPARISON OF VOCABULARY SCORES ON THE STANFORD-BINET AND THE REVISED STANFORD-BINET

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The vocabulary list of one hundred words from the Standord-Binet was administered to one hundred unselected adult patients. The words were given in alphabetical order because an order of increasing difficulty tends to make the subject feel frustrated. All responses were recorded by the examiner; they were marked as right or wrong by Miss Daphne Joennson and the author.[1] After the tests had been marked, the number of correct responses was obtained for the one hundred words of the Stanford and for the forty-five of them that appear on the Stanford Revision, Form *L*. Mental age ratings for these scores were given as that age level at which the vocabulary was passed, that is, any score between fifty and sixty-four words on the Stanford was rated at fourteen years; any score between twenty-three and twenty-five on the Revised Stanford was rated at seventeen years, four months.

Although the percentages of words known on the two tests were the same, and the correlation between the tests was .86, the mental age

| | Cases | Mean |
|---|---|---|
| Shakow and Goldman | 346 | 56.1 |
| Weisenburg, Roe and McBride | 69 | 54.5 |
| Fry | 227 | 51.7 |
| Terman | 482 | 52.5 (est.) |
| Babcock | 264 | 51–57 |

rating from vocabulary on the revised test was invariably higher than that on the 1916; the average of the differences in mental age ratings was 3.81 years. The least difference was 1.33 years; the greatest was 6.33 years. Table I gives the actual scores and ratings for each of the one hundred patients. Case numbers in the table show the order in which the patients were tested. Table II gives the mental age distribution for the group. The average number of words passed on the 1916 vocabulary was 54.4, MA 14-0; on the new 24.1, MA 17-4.

[1] Miss Joensson administered most of the tests.

TABLE I.—SCORES ON STANFORD-BINET AND REVISED STANFORD-BINET

| Case No. | 1916 | | Revised | | Case No. | 1916 | | Revised | |
|---|---|---|---|---|---|---|---|---|---|
| | Score | MA | Score | MA | | Score | MA | Score | MA |
| 73 | 24 | 8-0 | 11 | 10-0 | 84 | 56 | 14-0 | 23 | 17-4 |
| 61 | 25 | 8-0 | 13 | 10-0 | 47 | 56 | 14-0 | 24 | 17-4 |
| 66 | 25 | 8-0 | 13 | 10-0 | 46 | 57 | 14-0 | 24 | 17-4 |
| 56 | 29 | 8-0 | 11 | 10-0 | 8 | 57 | 14-0 | 25 | 17-4 |
| 76 | 34 | 10-0 | 15 | 12-0 | 4 | 58 | 14-0 | 24 | 17-4 |
| 79 | 33 | 10-0 | 16 | 14-0 | 60 | 58 | 14-0 | 24 | 17-4 |
| 3 | 33 | 10-0 | 18 | 14-0 | 70 | 58 | 14-0 | 24 | 17-4 |
| 31 | 34 | 10-0 | 16 | 14-0 | 13 | 58 | 14-0 | 25 | 17-4 |
| 81 | 34 | 10-0 | 16 | 14-0 | 90 | 61 | 14-0 | 25 | 17-4 |
| 78 | 34 | 10-0 | 17 | 14-0 | 87 | 63 | 14-0 | 25 | 17-4 |
| 96 | 36 | 10-0 | 17 | 14-0 | 35 | 56 | 14-0 | 26 | 19-10 |
| 91 | 37 | 10-0 | 16 | 14-0 | 59 | 56 | 14-0 | 26 | 19-10 |
| 37 | 37 | 10-0 | 16 | 14-0 | 89 | 56 | 14-0 | 26 | 19-10 |
| 36 | 38 | 10-0 | 16 | 14-0 | 52 | 58 | 14-0 | 26 | 19-10 |
| 55 | 38 | 10-0 | 18 | 14-0 | 32 | 58 | 14-0 | 27 | 19-10 |
| 42 | 34 | 10-0 | 20 | 15-4 | 6 | 59 | 14-0 | 26 | 19-10 |
| 68 | 40 | 12-0 | 18 | 14-0 | 27 | 59 | 14-0 | 26 | 19-10 |
| 77 | 41 | 12-0 | 18 | 14-0 | 65 | 59 | 14-0 | 26 | 19-10 |
| 95 | 41 | 12-0 | 18 | 14-0 | 67 | 59 | 14-0 | 28 | 19-10 |
| 80 | 42 | 12-0 | 18 | 14-0 | 11 | 60 | 14-0 | 26 | 19-10 |
| 53 | 45 | 12-0 | 20 | 15-4 | 28 | 60 | 14-0 | 26 | 19-10 |
| 5 | 46 | 12-0 | 20 | 15-4 | 71 | 61 | 14-0 | 27 | 19-10 |
| 44 | 48 | 12-0 | 20 | 15-4 | 88 | 61 | 14-0 | 29 | 19-10 |
| 34 | 45 | 12-0 | 24 | 17-4 | 92 | 61 | 14-0 | 29 | 19-10 |
| 49 | 46 | 12-0 | 23 | 17-4 | 16 | 62 | 14-0 | 26 | 19-10 |
| 82 | 47 | 12-0 | 23 | 17-4 | 19 | 63 | 14-0 | 28 | 19-10 |
| 54 | 48 | 12-0 | 25 | 17-4 | 75 | 63 | 14-0 | 29 | 19-10 |
| 86 | 49 | 12-0 | 23 | 17-4 | 30 | 64 | 14-0 | 29 | 19-10 |
| 48 | 49 | 12-0 | 25 | 17-4 | 14 | 65 | 16-6 | 28 | 19-10 |
| 38 | 50 | 14-0 | 21 | 15-4 | 23 | 65 | 16-6 | 28 | 19-10 |
| 12 | 50 | 14-0 | 22 | 15-4 | 58 | 65 | 16-6 | 29 | 19-10 |
| 2 | 52 | 14-0 | 22 | 15-4 | 83 | 66 | 16-6 | 27 | 19-10 |
| 33 | 53 | 14-0 | 22 | 15-4 | 20 | 66 | 16-6 | 28 | 19-10 |
| 51 | 54 | 14-0 | 21 | 15-4 | 29 | 66 | 16-6 | 29 | 19-10 |
| 69 | 54 | 14-0 | 22 | 15-4 | 93 | 68 | 16-6 | 27 | 19-10 |
| 72 | 56 | 14-0 | 21 | 15-4 | 10 | 68 | 16-6 | 28 | 19-10 |
| 63 | 56 | 14-0 | 21 | 15-4 | 15 | 66 | 16-6 | 30 | 22-10 |
| 94 | 58 | 14-0 | 22 | 15-4 | 21 | 66 | 16-6 | 30 | 22-10 |
| 57 | 50 | 14-0 | 23 | 17-4 | 24 | 69 | 16-6 | 31 | 22-10 |
| 41 | 50 | 14-0 | 25 | 17-4 | 26 | 70 | 16-6 | 32 | 22-10 |
| 99 | 50 | 14-0 | 25 | 17-4 | 74 | 70 | 16-6 | 32 | 22-10 |
| 25 | 51 | 14-0 | 25 | 17-4 | 64 | 71 | 16-6 | 31 | 22-10 |
| 98 | 52 | 14-0 | 25 | 17-4 | 22 | 75 | 19-6 | 32 | 22-10 |
| 50 | 53 | 14-0 | 23 | 17-4 | 45 | 75 | 19-6 | 36 | 22-10 |
| 7 | 54 | 14-0 | 23 | 17-4 | 43 | 76 | 19-6 | 33 | 22-10 |
| 1 | 54 | 14-0 | 24 | 17-4 | 40 | 76 | 19-6 | 35 | 22-10 |
| 100 | 54 | 14-0 | 25 | 17-4 | 9 | 79 | 19-6 | 33 | 22-10 |
| 97 | 55 | 14-0 | 24 | 17-4 | 85 | 81 | 19-6 | 35 | 22-10 |
| 17 | 55 | 14-0 | 25 | 17-4 | 62 | 82 | 19-6 | 35 | 22-10 |
| 39 | 55 | 14-0 | 25 | 17-4 | 18 | 85 | 19-6 | 35 | 22-10 |

The medians were, respectively, fifty-six and twenty-five. Shakow and Goldman (1938)[1] cite the figures on the 1916 Stanford vocabulary test for adult populations as shown in the table on p. 467.

All these figures place the average adult mental age rating obtained from the Stanford vocabulary at about fourteen years, which rating coincides with the generally accepted view that the average intelligence level is fourteen years. The results from the one hundred patients in this hospital agree so closely with the above investigations on the

TABLE II.—MENTAL AGE DISTRIBUTIONS

| | MA | Stanford No. cases | Revision No. cases |
|---|---|---|---|
| Terman's classification | | | |
| Superior adult III | 22-10 | .... | 13 |
| Superior adult II | 19-10 | .... | 26 |
| Superior adult | 19-6 | 8 | |
| Superior adult I | 17-4 | .... | 29 |
| Average adult | 16-6 | 14 | |
| Average adult | 15-4 | .... | 13 |
| | 14-0 | 49 | 14 |
| | 12-0 | 13 | 1 |
| | 10-0 | 12 | 4 |
| | 8-0 | 4 | |
| Average of mental ages | ..... | 13.8 | 17.6 |

Stanford vocabulary that the fact that their average mental age rating on vocabulary becomes approximately 17-4 on the Stanford Revision should be given serious consideration.

[1] Shakow, David and Goldman, Rosaline: "The Effect of Age on the Stanford-Binet Vocabulary Score of Adults. *J. Educ. Psychol.*, Vol. XXIX, 1938, pp. 241–256.

# THE CORRELATION BETWEEN SCORES EXPRESSED AS PERCENTILES

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It sometimes happens that it is necessary to compute the coefficient of correlation between two series of scores, one or both of which may be expressed in terms of percentiles of some standard population. Since such percentiles will not form a complete continuous series, the Spearman rank method is inapplicable. Hull[1] recommends trans-

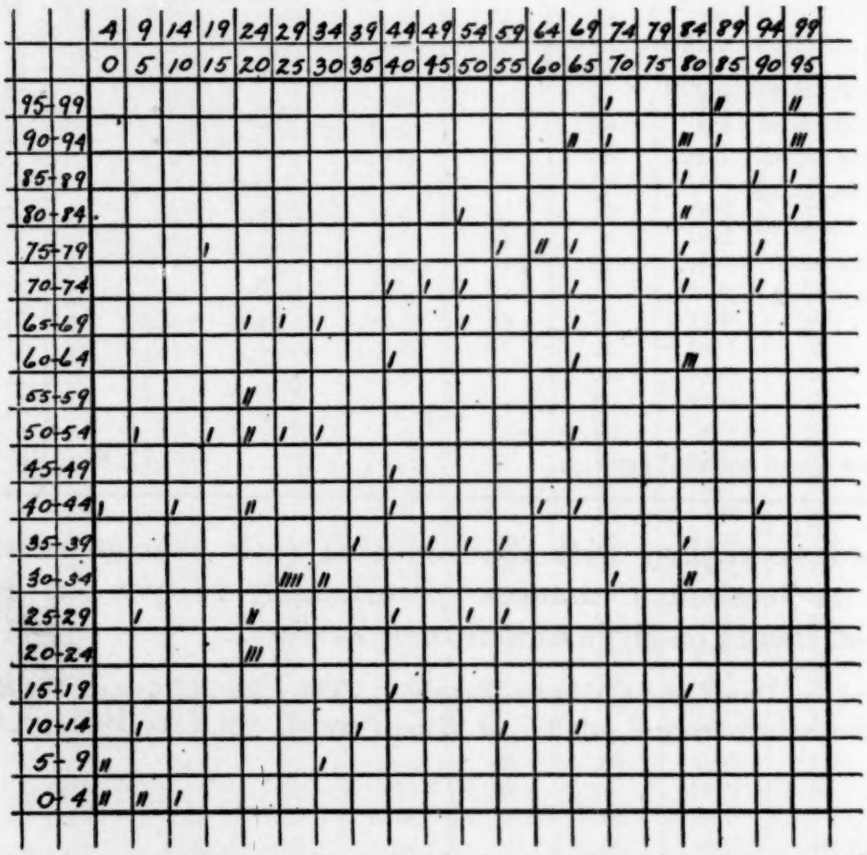


FIG. 1.—A scatter diagram of one hundred cases plotted in five-percentile steps. The Pearsonian product-moment coefficient of correlation obtained from this diagram is .665. The correlation between the raw scores before conversion into percentiles was .700.

mutation into linear units and the use of the Pearson product-moment coefficient. Kelley[2] suggests that it is better to compute the Pearsonian coefficient directly between a series of ranks and a series of variates, correcting the coefficient for the distortion thus introduced. Peters and Van Voorhis,[3] although somewhat vague on this point, say

that the Pearson formula may be applied to two series of percentiles, without correction, in spite of the rectangular distributions.

It is possible, however, to compute the Pearson product-moment coefficient between two series of percentiles (or one series of percentiles and one series of variates) without either the additional labor of Hull's transmutation or the error involved in the Peters-Van Voorhis

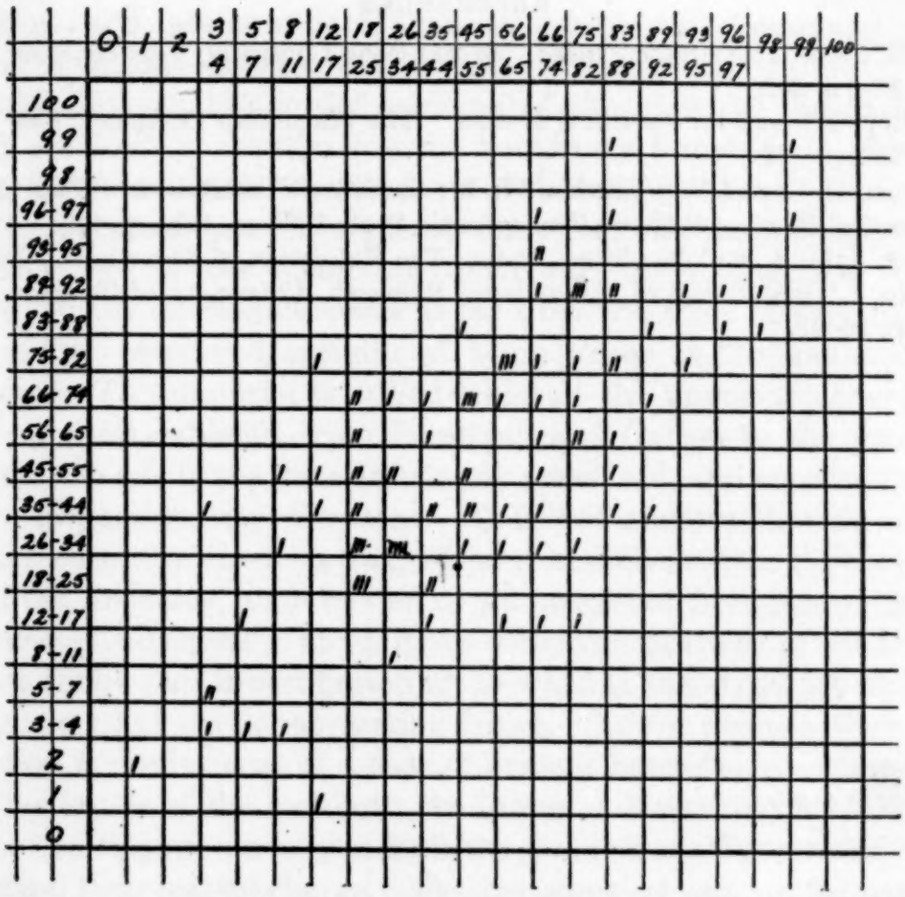


FIG. 2.—A scatter diagram of the same one hundred cases as in Fig. 1 plotted in terms of the Kelley-Wood intervals. The Pearsonian product-moment coefficient of correlation computed from this diagram is .698, corresponding closely to that obtained from the raw scores (.700).

recommendation. This is accomplished by grouping the percentiles into class intervals unequal in centile units, but approximately uniform in terms of standard deviation units. A 21 interval scale for the grouping of percentages in item analysis, prepared by Ben D. Wood from a method developed by T. L. Kelley, is reported by Long and Sandiford.[4] Percentile scores plotted in these units yield a scatter diagram similar to that obtained from a distribution of standard scores. By

using these class intervals as equal units, the true Pearsonian $r$ may readily be computed.

Figures 1 and 2 show the same two series of percentiles plotted first in terms of equal percentile steps and then in the "normalizing" percentile steps. The correlation from the second chart differs to a negligible extent (.002) from that between the raw scores.

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2. Kelley, Truman L.: *Statistical Method.* The Macmillan Company, New York, 1923, p. 194.
3. Peters, C. C. and Van Voorhis, W. R.: *Statistical Procedures and Their Mathematical Bases.* Authors, Pennsylvania State College, 1935, p. 92.
4. Long, John A. and Sandiford, Peter: *The Validation of Test Items.* Bulletin No. 3, Department of Educational Research, University of Toronto, 1935, pp. 36–37.

# BOOK REVIEWS

LOUIS P. THORPE. *Psychological Foundations of Personality.* New York: McGraw-Hill Co., 1938, pp. 602.

Here is a heavy, meaty book which deserves serious consideration. It is full of scholarly lore concerning man's interest in that most fascinating of all subjects, the personality. It is a well organized, thoughtful, and philosophical treatise, which will command the attention of serious students in the field.

Thorpe devotes the initial sections of the book to the task of defining personality, scrutinizing the hereditary foundations of individuality, and tracing the development of the intelligence and educability of the personality. Throughout these sections there is much of the atmosphere of the dissecting room and the microscope. Not infrequently the discussion seems as far from the topic of personality as the neatly preserved sections of brain tissue in the anatomist's laboratory. The material is culled from all the important previous writers on these subjects, from Rousseau and Galton to the present time. On the whole the data are clearly presented, and contradictory evidence dispassionately discussed. It is unfortunate that an occasional slip occurs, such as stating, without any discussion, that feeblemindedness, insanity, and hysteria, are recessive Mendelian traits. This extreme statement is at variance with later portions of the book.

There follows an investigation as to what is the structure of personality and what are its motivating forces. To the present reviewer, this section is reminiscent of a tour of ancient battlefields. Here was fought the battle of the instincts, the forces of James and McDougall encamped on this spot, over yonder is the wood where Watson and Kuo commenced their fearful charge. Further along we come to the battleground of emotions, that scene of slaughter, where we follow the orderly troop movements of the James-Lange theory, Cannon's flanking attack, Gray's onslaught, the strategy of Landis' march, the erratic aerial and subterranean attacks of the psychoanalysts, and the like.

So much is this the viewpoint in discussing drives, maturation, and emotional conditioning, that there are times when it seems that the title of the book should be "The Historical Foundations of the Psychology of Personality." Throughout these chapters the author makes no attempt to contribute any new or original thought to these problems. Indeed, his own attitude is often in doubt, so conscientiously does he balance the pros and cons of each argument. It is

probably typical of his approach that in the course of the book he manages to do away with "instincts," "mind" (as a separate or disembodied entity), "emotions," "traits," and "types," as these words are generally understood, without quite making plain his own total view of the structure of personality. His views are clearest in regard to traits, where his carefully documented presentation casts doubt upon the existence of specific personality traits, but sums up convincingly the evidence for more generalized sets or tendencies.

When it comes to the mechanisms of personality disturbances, and the means of personality adjustment and integration, we find the author for the first time writing of total personalities, not dissected specimens. There is a clear discussion of the hereditary and physical conditions which may cause maladjustment, as well as the psychological factors. Mechanisms of adjustment are classified in a form which is at least logically attractive. Reactions are grouped under the headings of forgetting reality, (fantasy), distorting reality (rationalizing tendencies), atoning for reality (compensation), retreating from reality (neurotic reactions), and facing reality, the last including both constructive and destructive attempts to solve situations directly.

The book is concluded with a presentation of the various attempts to appraise personality either through physiological measurements or through psychological measurements such as personality tests. Here again we have a sound and critical historical survey of the field, with the author maintaining an optimistic view regarding the future of personality tests.

The book's outstanding weakness is its complete reliance upon the past. Unless a topic is already a respectable part of several previous textbooks, it is not regarded as worthy of inclusion. Nowhere is this so evident as in the complete omission of any reference to the influence of family relationships upon personality. Although Thorpe stresses the genetic approach to personality formation, the early development of behavior patterns, and the importance of early environment, one can read the entire book without ever learning that these beginnings take place in family life. One is forced to conclude that while genes and hormones, drives and emotions, maturation and emotional conditioning, all preside at the birth of personality or nurse it during infancy, parents are definitely not present. It has been traditional for psychologists to ignore the existence of family relationships, and to refuse to recognize that emotional conditionings take place in, and social culture is mediated through, a family setting.

This book carries such a tendency to what is, it is to be hoped, its ultimate absurdity. The family and its formative relationships are never taken up in any way. In a comprehensive index there is room for all sorts of topics from "astrology" to "unit characters." There is even mention of foster homes. But one will look in vain for mention of parents, parental attitudes, sibling rivalry, or any other term which applies to this all-important factor in the development of personality. One even discovers the intriguing item, "cell relationships, dynamic character of," but "family relationships, dynamic character of" is a topic unmentioned either in the index or in the book. It is little short of astounding that the author can devote page after page to the various angles of the nature-*vs*-nurture argument, without once mentioning that crude social vehicle through which both nature and nurture exert their primary influence—the family.

One lays down this book with the feeling that here are six hundred pages of valuable material, a compendium of available research, a resumé of conflicting historical theories, a generally sound foundation for thinking about personality. A modern psychology of personality can be built upon this foundation, but it has been, in these pages, only partially constructed.

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THOMAS H. BRIGGS and OTHERS. *Laboratory Techniques of Teaching.* New York: Bureau of Publications, Teachers College, Columbia University, 1938, pp. 81.

This monograph consists of some six "papers" written by students in Education 335-6M, the Advanced Major Course for workers in secondary education at Teachers College. Briggs is responsible for the forward and his name appears on the cover. Chapters III and IV contain concise summaries of the research studies which have sought to determine the relative effectiveness of the conventional *versus* the laboratory methods of instruction. The essential characteristics of the latter are described as (1) the unit assignment; (2) individualization of instruction; (3) decreased emphasis upon the recitation; and (4) the use of class time as a free study period. (Pp. 12–16.)

Despite the fact that forty-eight of the research studies favored the laboratory method, as against but ten supporting more conventional instruction, these "practical school people"—in answer to the question "Should high-school teachers employ laboratory techniques?" —hedged like a group of professional educationalists. To wit: (p. 65).

(1) Research indicates that the recitation method is under attack and that laboratory techniques are at least not inferior on the basis of certain criteria.

(2) The reasons why the characteristics of laboratory techniques have been deemed desirable deserve the careful consideration of teachers.

(3) No single method will apply in every situation, but a variety of techniques applied in various combinations may be effective.

The above statements may be true, they could hardly be otherwise, and their caution is admirable, but some one wasted a lot of time if he studied everything in the Columbia University Libraries dealing with laboratory instruction (p. 2) in order to support such enervating generalizations.

The 149 item-classified and selected bibliography which appears at the end of the volume is a good one.

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E. D. PARTRIDGE. *Social Psychology of Adolescence.* New York: Prentice-Hall, 1938, pp. 361.

The author sets for himself the task of surveying those portions of the fields of sociology and psychology which relate to young people in modern society. The social rather than the physiological implications of adolescence are regarded as giving adolescence its importance as a period of development in modern society. The author's approach to the problems of behavior reflects an acknowledged influence of *Gestalt theorie.* Particularizing analysis and the statistical approach are rejected in favor of the field-theoretical approach with its emphasis upon the relational nature of behavior.

In the first two chapters an introduction to the problems of adolescence is presented in which the author emphasizes the rôle of cultural patterns in determining behavior. Comprehension of the phenomena of adolescence, he insists, demands that the relational aspects of the adolescent and his environment be the chief object of study. The remaining chapters are devoted to the social psychology of the adolescent. Consideration turns first to a survey of the nature of the individual and the social implications of the differences which exist between individuals. Successive chapters deal with the informal group, the influence of adolescent leaders, and group influences as they react upon the individuals composing the group. The next chapters deal with factors which serve to influence the behavior of the

adolescent such as family, community, educational process, etc. The book concludes with a consideration of the social psychology of delinquency and the social approach to behavior difficulties.

The book impresses the reviewer as being ably written. While there is a minimum of illustrative materials in the form of tables and graphs, the literature cited is well chosen and contemporary. The author's style of writing is refreshing, and in an important field of psychology, hither before inadequately represented in textbooks, this work represents a real contribution. The reviewer regards the author's failure to treat the physiological aspects of adolescence as his most serious omission. In courses in which the book is used as a text, this lack might well be supplied by supplementary readings. Certainly by his emphasis upon the importance of social and cultural determinants of behavior, the author has achieved a unity of treatment too often lacking in similar texts in this field.

J. M. Porter, Jr.

Carnegie Institute of Technology.

Ellis Freeman. *Principles of General Psychology*. New York: Henry Holt & Co., 1939, pp. 530.

Albert C. Reid. *Elements of Psychology*. New York: Prentice-Hall, Inc., 1938, pp. 409.

Elementary psychology texts have been so common during the past few years that new ones excite little interest. Apparently publishers are willing to issue them in the hope that they may strike a new Woodworth or a new Dashiell. Of the two books here reviewed, that by Freeman is more worthy of notice.

Freeman defines psychology as "the science of the experiences and behavior of organism" (p. 3) and later says that "the purpose of the study of psychology in the broadest sense is to understand personality" (p. 302). In line with this viewpoint of the nature of psychology, the author organizes his materials in a refreshingly new fashion, with Part I devoted to the principles of behavior and Part II to the principles of perception. In Part I he discusses in a lucid style without sacrifice of scientific exactness such topics as intelligence, individual differences, emotions, motivation, personality, and learning. Sensation and perception are treated with a Gestalt emphasis in the second part, comprising the last third of the book. The appreciation of current trends in psychology, the clear style, sound science,

and adequate documentation, all suggest that this should be an important elementary text.

Reid's volume will have a very limited appeal. "Psychology is the study of the mind"; a mind conceived of as real with "its own basic characteristics and modes of activity." Except for a weak concession to modern psychology in one chapter on action, this text is a simple rewriting of Titchener. Unfortunately, Boring, Langfeld, and Weld have dealt so recently and so well with existential psychology that this text can scarcely hope to find wide usefulness.

C. M. Louttit.

Indiana University.

C. W. Watkeys and Associates. *An Orientation in Science.* New York: McGraw Hill, 1938, pp. 560.

This volume presents a survey of the physical and biological sciences developed at the University of Rochester during the past decade. Its purpose is threefold: To acquaint the student with the scientific method of thought and procedure; to afford a bird's-eye view of the principles and problems underlying various branches of science; and to make the student conscious of the relations existing between the various branches of scientific endeavour.

Sections dealing with the various branches of science were written by members of the faculty at the University of Rochester. In all there are thirteen sections and an introduction. The introduction discusses scientific method and the branches of science. Fields of scientific endeavour which are considered include: Astronomy, geology, chemistry, physics, biology, paleontology, physiology, bacteriology, psychology, and mathematics. The book concludes with a section on scientific method.

It is, of course, impossible for one man accurately to evaluate a work of such a wide scope. The book impresses the reviewer as being well suited to a collegiate orientation course in general science—the purpose for which it was written. It should especially appeal to students possessed of a curiosity concerning the world in which they live. The scientifically naive student may find certain of the sections rather difficult but perseverance will almost surely guarantee the disappearance of his naivete. The writers appear to have succeeded remarkably well in the attainment of their threefold purpose. The treatment of the various topics is such as to make the reader conscious

of the manifold relationships existing between the so-called fields of science, thus making apparent the essential unity of all scientific endeavour.

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Carnegie Institute of Technology.

GOODWIN WATSON, DONALD P. COTTRELL, and ESTHER M. LLOYD-JONES. *Redirecting Teacher Education.* New York: Bureau of Publications, Teachers College, Columbia University, 1938, pp. 105.

This stimulating book is the outgrowth of a study of the program of Teachers College, Columbia University. The authors let themselves go and described calmly and well their image of the teacher-training institutions of the future. Throughout the volume there is a certain indifference to practical difficulties which implies to the reviewer not a refusal to recognize them but rather concern with another purpose; namely, a discussion of what we educationalists *might* be doing.

The authors are decidedly Progressive in spirit. They accept the position that the schools should do almost everything, and the teacher-training institutions of the future must prepare teachers equipped to aid children toward maturity in all areas. This emphasis is the only quarrel the reviewer would have with the authors, and it would probably not be a spirited one. There are other institutions, after all, and their responsibilities are considerable. To hold the school responsible for stimulating all types of growth is too ambitious. No institution is or should be that big or influential. The qualifications of the teacher for that sort of school are staggering, which makes the objectives of institutions planned to train teachers all inclusive. The brief chapter (5) entitled "The objectives of teachers' colleges" emphasizes conduct controls that everyone would recognize to be fine, but which after all can be but very imperfectly approximated in the time allotted by society for the training of teachers.

The authors of *Redirecting Teacher Education* are not radical in their recommendations in the sense that every specific proposal they make has probably been discussed and approved in a large share of the departments of education and teachers colleges over the country. We must select candidates for degrees more carefully, keep accumulative records, practice more guidance, develop better tests of professional and general proficiency, provide a broader general and profes-

sional education including more integration both with respect to fields as well as theory and practice, present more opportunities for independent work, professional participation and growth in service, provide training in the use of the radio and the motion picture, and, lastly, make available modern physical facilities for the implementation of our program. In all of this the reviewer, and the majority of readers, will heartily concur.

As a glimpse at Utopia, the monograph is to be recommended. Reactions of educators will be varied. Many will snort and ask why the engine insists upon getting so far ahead of the train?

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EDWARD K. RAND and OTHERS. *On Going to College: A Symposium.* New York: Oxford University Press, 1938, pp. 298.

This book follows the pattern of a college orientation program in presenting a series of essays on the various subject-matter fields usually found in a general college. The written essays have many advantages over the usual lectures given to an assembly of restive college freshmen. They are given by experts in each field, with the perspective of ripe scholarship. They permit deep concentration on one area or rapid skimming of all. Collectively they give meaning to the concept "liberal education." Individually, each essay spotlights a particular area but never loses sight of its inter-relationships.

Among the contributors and contributions one finds: "Literature, Especially English Literature," by James Buell Munn, Harvard; "History," by Wallace Notestein, Yale; "The Social Sciences," by Robert Morrison Maciver, Columbia; "The Natural Sciences," by Arthur H. Compton, Chicago; and "Philosophy," by Irwin Edman, Columbia.

It is a real treat to read this book after having gone to college. About its use by high-school seniors or college freshmen, I have some doubts. Some will read it with great pleasure and profit. Others will read under pressure and will lose much of the pleasure, many of the values. It should be valuable to all counselors for their pleasure and extension of both horizon and perspective. It gives a broader picture of a college than many who have been through one have seen. Good homeroom teachers and others who conduct group guidance classes will find much help, many quotable hints.

H. B. MCDANIEL.